

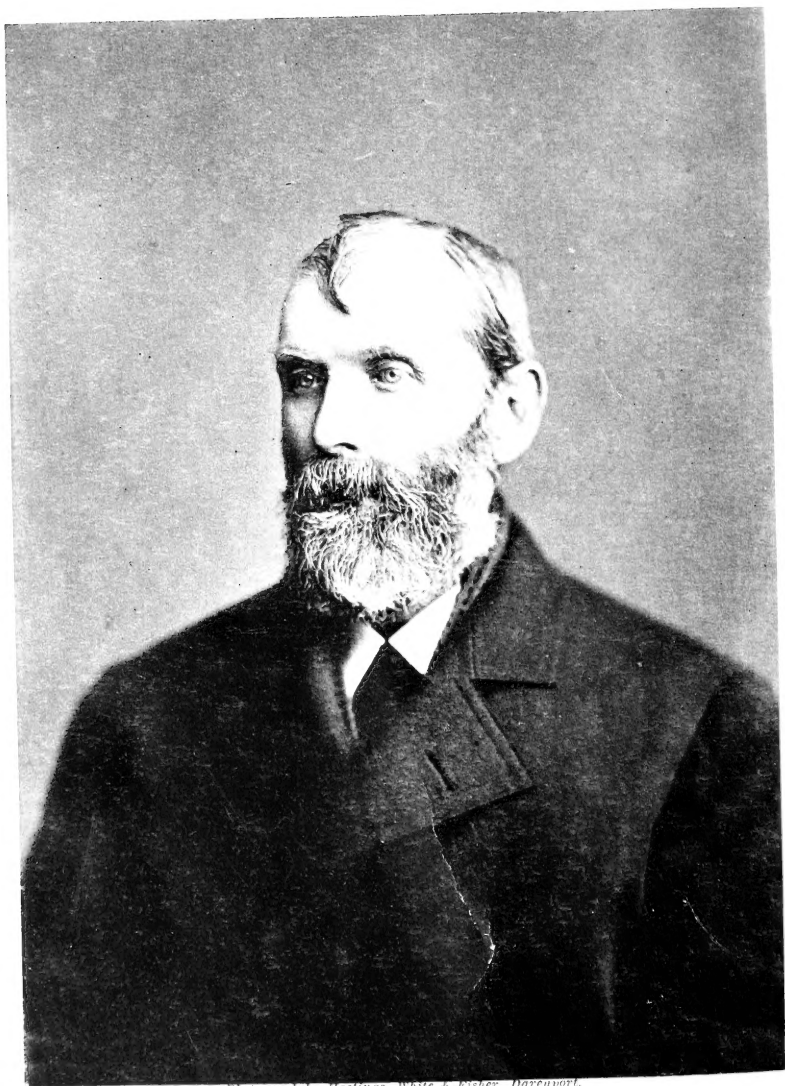


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Yours truly
R. J. Hargreaves

PROCEEDINGS

OF THE

DAVENPORT ACADEMY

OF

NATURAL SCIENCES.

VOLUME IV.

1882-1884.

DAVENPORT, IOWA:

PUBLISHED BY THE ACADEMY OF NATURAL SCIENCES.

1886.

PUBLICATION COMMITTEE—1885-86.

Mrs. M. L. D. PUTNAM, *Chairman*.

Dr. C. C. PARRY.

Rev. W. H. BARRIS.

JAMES THOMPSON.

Dr. C. H. PRESTON.

The authors of the various papers are alone responsible for what is contained in them.

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PREFACE.

IN presenting to the scientific public Volume IV. of the Proceedings of the Davenport Academy of Natural Sciences, the Publication Committee entertains the hope that it may be found not unworthy its predecessors. In its preparation some discouraging obstacles have been encountered, but through the generous support of friends of the Academy, here and elsewhere, these have been successfully surmounted, and it is now completed, ready for distribution, with only a slight indebtedness, which, it is confidently believed, will be easily liquidated from sales of the volume. When it is considered that these publications are carried on without any stated fund for the purpose, but relying entirely upon voluntary contributions, lovers of science elsewhere should derive encouragement, and be inspired to similar efforts by the success of the undertaking.

The present volume contains a brief synopsis of the proceedings of the Academy for the years 1882, 1883, and 1884. In its preparation the records of routine and unfinished business, and of meetings of Trustees, have been omitted, in order that greater space might be reserved for papers of permanent scientific interest. The contributions to the museum during the years 1879, 1880, and 1881 are also included in this volume.

As a matter of great practical interest, because of the encouragement it affords to scientific study and research, the payment of the large indebtedness incurred in the erection of the Academy building, and the commencement of a permanent endowment fund, deserve special mention. This good work was accomplished in 1883, during the Presidency of E. P. Lynch, Esq.; and while the citizens of Davenport generally are entitled to grateful thanks for their generous contributions, the timely and well-directed exertions of Hon. George H. French, Major George P. McClelland, and Nicholas Kuhnen, Esq., in bringing about these satisfactory results, are deserving of hearty acknowledgments from all the votaries of science.

The present volume will be found to contain some valuable contributions, not only to the flora of Iowa, but to the science of botany. Mr. J. C. Arthur has furnished to it numbers V. and VI. of his "Contributions to the Flora of Iowa." These papers, which commenced with the publications of the Academy, and have gone through all its volumes, have been well received by botanists, and are re-

garded as containing valuable additions to the science. This department of science has been further illustrated by our associate, Dr. C. C. Parry, whose botanical papers in the present volume are deserving of especial notice. These contributions are: "*Arctostaphylos*, Adans.," consisting of notes on the United States Pacific coast species from recent observations of living plants, including two new species from Lower California; also a description of some "New Plants from Southern and Lower California." But by far the most notable of his contributions is his paper on "*Chorizanthe*, R. Brown," wherein the writer undertakes the revision of the genus, and rearrangement of the annual species, with one exception, in all North America. It is a gratification to be able to note the fact that this "new departure" in the science by the revision and rearrangement made by Dr. Parry has been received with favor by botanists generally, and has been adopted at the Royal Herbarium, Kew Gardens, England.

This volume also contains interesting papers by Prof. E. W. Claypole, on "The Chambers Lightning Rod;" by Mr. Charles Wachsmuth, "On a New Genus and Species of Blastoid," and a "Description of a New Crinoid from the Hamilton Group of Michigan;" and by Prof. W. H. Barris, "Descriptions of some New Blastoids from the Hamilton Group," a "Description of some New Crinoids from the Hamilton Group," and "*Stereocrinus*, Barris." The papers by Mr. Wachsmuth and Professor Barris are finely illustrated, and the articles upon the "Blastoids," which first appeared in Volume VII. of the Illinois Geological Reports, have been carefully revised by the authors for this volume. Geologists will find in these well-considered papers the results of much careful study and close observation, and, in the line of original research, will welcome them as valuable additions to the science.

An interesting contribution to the science of archaeology, by Dr. W. J. Hoffman, of the Bureau of Ethnology, connected with the Smithsonian Institution, is contained in this volume, in his paper entitled "Remarks on Aboriginal Art in California and Queen Charlotte's Island." The illustrations which accompany this article were furnished by the author. A further archaeological contribution of more than ordinary interest is made by William H. Holmes, who is connected with the United States Geological Survey and Bureau of Ethnology, Washington, D. C. This monograph is entitled "Ancient Pottery of the Mississippi Valley," and is a study of the collection in the museum of the Davenport Academy, which is considered one of the most valuable in the country. Mr. Holmes is a skillful artist, and made the drawings of our pottery which were used for the illustrations which accompany his article. These illustrations were furnished by the author, through the department with which he is connected, without expense to the Academy. It will be noticed, from the record of proceedings, that the proposition of Mr. Holmes, on behalf of the Bureau of Ethnology, to engrave the pottery in our museum for

the use of the Academy, on condition that the Bureau should also be allowed to make use of them in its publications, was a principal inducement to the early publication of this volume.

In the same line of research, Mr. C. E. Harrison has a paper entitled "A Report of Mound Explorations near Pine Creek, Muscatine County, Iowa," and Dr. C. H. Preston another, entitled "Mound Explorations near Joslyn, Rock Island County, Illinois." The excellent "Biographical Sketch of the late Dr. Robert James Farquharson," by Dr. W. D. Middleton, will be read with interest by the many friends and admirers of our deceased associate. The fine phototype portrait of Dr. Farquharson, which forms the frontispiece to the volume, was furnished with the assistance of the Scott County Medical Society, aided by a generous contribution from J. D. Campbell, Esq., of New York.

A revised edition of a paper entitled "Elephant Pipes and Inscribed Tablets in the Museum of the Academy of Sciences, Davenport, Iowa," by Charles E. Putnam, together with selections from the correspondence connected therewith, is included in an appendix to this volume. This paper was originally prepared and distributed as a separate publication, for the purpose of vindicating the genuineness of the relics in question, the integrity of the discoverer, and the good faith of the members of the Academy. The occasion which made it necessary was an article by Henry W. Henshaw, in the Second Annual Report of the Bureau of Ethnology, entitled "Animal Carvings from Mounds in the Mississippi Valley," wherein an unjustifiable assault is made upon the authenticity of the elephant pipes and inscribed tablets, and in connection with their discovery Rev. Mr. Gass is plainly charged with the perpetration of a fraud. These ruthless accusations had the endorsement of Major J. W. Powell, Director of the Bureau, and, being embodied in the ponderous report of that department, were thus secured a permanent place in scientific literature. As this Government publication was destined to pass into the hands of investigators who would have no data by which they could detect the many blunders and misstatements in Mr. Henshaw's paper, it was calculated to do the Davenport Academy great injury; and hence, as a partial protection against this injustice, it was deemed advisable to include the "Vindication" prepared by Mr. Putnam among the permanent publications of the Academy.

The publication of Volume V. of the Proceedings has already been commenced. No less than four valuable scientific papers are now in the hands of the printers, and these will be issued and distributed as part of the volume. Among these papers, Prof. W. H. Barris, of Griswold College, contributes a review of a pamphlet on the "Geology of Scott County, Iowa, and Rock Island County, Illinois," by Mr. A. S. Tiffany. This review, while it is entirely impersonal, is a searching criticism, from a scientific stand-point, of the publication in question, and it will be found a valuable contribution to the geological history of this vicinity.

Prof. R. E. Call and Mr. H. A. Pilsbry jointly contribute a paper entitled "On *Pyrgulopsis*—a New Genus of Fresh-water Rissoidæ, with Descriptions of New Species." Professor Call also contributes an illustrated paper on "Certain Recent and Quaternary Fresh-water Mollusca," and Mr. Pilsbry another on local mollusca. These papers are the results of original research, and add new and important facts to the interesting science of conchology.

In presenting this sketch of the scientific progress of the Academy, mention should be made of the formation in this city of two chapters of the Agassiz Association of America, with the purpose in view of engaging in the study of the natural sciences. This Association is to hold a national convention in this city during the coming summer. Another organization has been established here, known as the "Humboldt Society," which seeks to unite philosophical speculations with scientific investigations. All these societies hold their meetings in the Academy building. It is an interesting circumstance that the membership of these organizations is made up wholly of young men and women, largely students in our public schools, and from these sources, in the near future, the Davenport Academy is encouraged to expect valuable additions to its own membership.

The Publication Committee desires to express its obligations to Mr. C. E. Putnam for his valuable assistance in preparing the synopsis of proceedings for publication; and also to Mr. C. D. Glass, of the publishing house of Glass & Axtman, for his efficient aid in proof-reading, and for his excellent work in the printing of this volume.

DAVENPORT, IOWA, March 22, 1886.

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PROCEEDINGS
OF THE
DAVENPORT ACADEMY
OF
NATURAL SCIENCES.

VOLUME IV.

RECORD OF PROCEEDINGS.

JANUARY 4TH, 1882.—ANNUAL MEETING.

The President, Dr. C. H. Preston, in the chair.

Sixteen members and three visitors present.

The reports of officers were presented and referred to the Publication Committee :

PRESIDENT'S ADDRESS.

LADIES AND GENTLEMEN OF THE ACADEMY:—Having occupied for so short a time the chair made vacant by the death of our late honored associate, J. Duncan Putnam, I feel most painfully my inability to take his place to-night, to offer an acceptable substitute for the address we had hoped to hear from his earnest lips. Living in and for the Academy, and in that love of nature and nature's truths which the Academy represents, he knew its every want, its points of weakness and of strength, all it has done, is doing and hopes to accomplish. Each addition to library or museum he not

only noted and appreciated but rejoiced in, as a more than personal gain. Had he been spared but a few short weeks, the address you would have listened to now would have glowed with the warmth of a paramount labor of love.

As it is, I can do little more than refer you to the various official reports which have just been read in your hearing, and point to this building with its large recent addition of shelf-room, already crowded and insufficient, as the best witness of results to date and of pressing wants for the future.

The year just past has been, in the aggregate, about equal to the prosperous year preceding, in additions to library and museum; but in increase of membership and attendance at meetings there has been something of a falling off. Nine regular, two life, and six corresponding members have been added, which would show a healthy growth if all members, both old and new, would maintain an active interest in meetings and work. But an average of ten only at the regular meetings, with but four meetings of the Board of Trustees, does not evidence that interest which ought to exist. As to the difficulty experienced in assembling a majority of our fifteen Trustees, it has been largely due to the retention in office of honored members who have ceased to reside in our midst. Desirable as it is to lose none of the influence and counsel of firm friends and former associates, I think it advisable that the Board should, in the future, consist wholly of resident members; to the end that the affairs of the Academy may not suffer neglect. The number constituting a quorum might indeed be reduced, but not without amending the articles of incorporation, and the move might not be for the best. In the work proper of the Academy our one great want is interested hearts with willing hands.

In science as elsewhere, there occurs but seldom, unfortunately, that happy combination of circumstances which clears all obstructions from the road to success. The man who, to an ardent love for some special branch of scientific work, adds an aptitude for it, health, mental ability, and means, and is spared to pursue it to a ripe old age, is favored almost beyond the acme of human hope; and all that he can accomplish in a lifetime, at his chosen pursuit, for the mental or physical improvement of his fellow men, is cheerfully given in return. But few indeed have the liking combined with the brains and strength for continuous hard mental work; and of those so gifted, few but are forced to limit their studies to odd hours stolen

from the struggle for daily bread. And how often, alas! is the earnest young scientist, who, born for his work, drawn to it as by an irresistible magnet, having mastered opposition and seen the way to usefulness and distinction opening up brightly before him, how often, in the mysterious ordering of earthly events, is he called on to stay his feet on the threshold, to give up high hopes and unselfish ambition, and—like him we so newly and deeply lament—to lay down his life and his life-work unfinished together!

That our honored associate, knowing as he did, the probable event, knowing that his day of work must end with the morning hours, still kept right on, did not idly fold his hands and rest from the sowing whose harvest he might not reap, was the noblest act of a bright, inspiring life. Since to rest gave no hope of recovered health or even of long reprieve, the talents entrusted to his keeping might not lie unused for a moment.

What a lesson for the vigorous youth of our city, for many members of this organization even, who are letting the golden days speed by unimproved; even seeking to hasten the flagging hours by frivolous or worse dissipation! Fragments of truth, in whatever field they may be found, are treasures the smallest of which may lead to a very Golconda of intellectual or material wealth. Truth-seekers in some, in *any* direction, are what humanity most needs. Here in this Academy is opportunity for mutually healthful work, but where are the host of workers? We should constitute a busy hive. Our shelves and publications should overflow with a honeyed store of original accumulations. Not many—though some, it is to be hoped—will be found among us to continue the special work which J. Duncan Putnam so loved. But Entomology and Embryology, out of which in a few short years he won an envied fame, are but parts of the broad field here lying fallow.

Is there not some one who could devote a portion of his time to collecting and studying our native birds, their habits, food, nesting, etc., and place in the museum a pair of each species, with eggs, nest, and description? The work once begun would widen out and afford recreation at least, for a lifetime. So with a study of the fishes and reptiles of our streams; our river and land shells; the small mammals of our woods and fields; our flowering herbs, shrubs, and forest trees; our mosses and ferns; fungi and infusorial life; crystal forms and chemical reactions; histology and comparative anatomy, etc. In each of the many departments of science, and in each many

times subdivided, there is work which we ought to do. Nature's voices call to us on every hand—unheeded. Those who listen, she makes immortal, as the bearers of good gifts. If the Academy had but a score of earnest workers, I have faith to believe it would not long lack support and appreciation. But a score of persons who can and will devote their whole time to natural science, is more than can be expected in a city of twenty-five thousand; simply because the born scientist is seldom born rich, and the child of affluence seldom combines aptitude, industry, and brains. There are many, however, who could and would be science-workers, in the intervals of other employ, if they could only be led to make the start. To such let me say: the Academy would be rich could it claim but a tithe of your wasted hours. Young ladies with not much to do but dress, make a study of some insect, or bird, or flower! Young men with part of each day unemployed, make some of your social calls on the denizens of the woods or of the microscopic world. Learn to observe, to interpret, and to describe!

It is a reproach to our city that we have not yet developed one skilled taxidermist. Such an one would be an invaluable aid to our growing museum. Will not some one resolve to thus earn the thanks of all who may visit the Academy in the future? Three or four earnest toilers have, thus far, done the work which makes our collection commendable as it is. From day to day and from month to month, new material has been added and has taken shape in the beautiful new cases as you see them; but it has not presented and arranged *itself*. Work, hard work, and unceasing care have been required and will continue to be required, or the Academy will cease to prosper. One of our two mainstays in the past has been called from earth, and the other is no longer able to make a free gift of his talent and time. I hope and trust that members and citizens will see the necessity, and come at once to the rescue. It is imperative that we enable our faithful Curator to continue the work that enlists his heart, the institution to retain its most essential officer.

With a debt, on building and cases, of some \$1600, and with annual receipts scarcely sufficient for current expenses, the work of Curator must go undone or be paid for by extra means. I trust I shall be pardoned for presenting this subject thus plainly and urgently, for it is one of vital importance. If we can tide safely over the present really perilous juncture, the Academy will go on with

a new lease of life, to become more and more useful, more creditable to its founders, and to the community of which it should be the pride.

TREASURER'S REPORT.

LADIES AND GENTLEMEN OF THE ACADEMY:—By the by-laws of the Academy it is made the duty of the Treasurer to render to the Trustees a general report, to be laid before the Academy at the annual meeting. In compliance with this requirement I hereby submit a statement of all receipts and disbursements during the past year, as follows, viz.:

GENERAL FUND.

RECEIPTS.		EXPENDITURES.	
Cash on hand, Jan. 1, 1881,	\$15 35	Janitor,	\$180 00
Assessments,	196 00	Door-keeper,	50 00
Initiations,	40 00	Printing and advertising,	35 75
Door receipts,	171 20	Coal, wood, and gas,	90 65
Rents,	3 00	Postage and revenue stamps,	23 90
Contribution box,	1 30	Photographing,	8 25
Freights returned,	2 40	Recording deed,	85
Loan on mortgage,	600 00	Freight and expenses,	54 66
Balance endowment fund,	14 50	Insurance,	18 75
Balance ladies fund,	96 38	Cases and repairs,	453 38
Advances by Treasurer,	82 94	Interest,	66 30
Cash in bank,	5 82	Note to C. E. Putnam,	239 90
		Cash with door-keeper,	6 50
Total,	\$1228 89	Total,	\$1228 89

Deducting from the cash advances as above reported, the balance remaining in bank, and it will leave the sum of \$77.12 due from the Academy to the Treasurer.

EDOWMENT FUND.

RECEIPTS.		EXPENDITURES.	
Balance on hand, Jan. 1, 1881,	\$3 00	Loaned general fund,	\$14 50
Donations,	11 50		
Total,	\$14 50	Total,	\$14 50

In addition to above Dr. A. S. Maxwell has made a donation of certain lots in Le Claire, valued at \$25.00, on account of this fund, and the Academy has received from him a deed for same.

LADIES SPECIAL FUND.

RECEIPTS.		EXPENDITURES.	
Balance on hand, Jan. 1, 1881,	\$ 04	Concert expenses,	\$40 00
Concert, Jan. 13, 1881,	201 90	Note, C. E. Putnam,	150 00
Washington tea party, Feb. 22.	75 65	Interest on loans,	59 20

RECEIPTS.		EXPENDITURES.	
Proctor's lecture, March 22	253 75	Washington tea party .	42 65
Macomber's lecture, April 4,	65 50	Proctor's lecture, . . .	134 25
Sales of articles donated, .	40 90	Mound fund,	39 50
Lemonade stand, July 4, .	36 66	Macomber's lecture, . .	59 25
Subscription,	20 30	Barrel of alcohol, . . .	18 50
Interest on bank account, .	1 28	Painting and papering, .	29 00
		Taxes on Davis county land,	3 45
		Chromos and frames, . .	2 00
		Lemonade stand,	3 30
		Glass jars and vials, . .	5 25
		Publication committee expenses,	8 25
		Mound builders' pottery, .	5 00
		Balance to general fund.	96 38
Total,	\$695 98	Total,	\$695 98

This fund is one not provided for in the by-laws, and has been thus separately stated to show the considerable amounts received through the extraordinary exertions of the ladies of the Academy.

PUBLICATION FUND.

At a meeting of the Trustees, January 20 h, 1881, they accepted a proposition of J. Duncan Putnam to furnish the use of type and printing material and to superintend the work of printing the proceedings of the Academy of Natural Sciences, the Academy to be responsible for all money expended for printing of proceedings other than for type and material. They also authorized the Publication Committee to resume the printing of Vol. III. of the proceedings. Under this arrangement the private printing press and type belonging to the Putnam brothers and sister, were transferred to the Academy. An arrangement was also made with Mr. Marsh, of the Gazette Company, to do the press-work for the Academy at \$1.50 per one thousand impressions, we to furnish forms ready locked up, and paper. The following is a statement of the receipts and expenditures on this account as near as I have been able to ascertain them, viz. :

RECEIPTS.		EXPENDITURES.	
Subscriptions to Vol. III, .	\$84 67	Gazette company, . . .	\$17 05
Donations,	35 65	Paper etc.,	120 55
Door money,	17 55	Compositors,	47 71
Lectures,	8 25	Express and freight, . .	11 43
Advances,	65 85	Balance in bank, . . .	15 23
Total,	\$211 97	Total,	\$211 97

Taking from "advances" above reported, the cash on hand, and it leaves the sum of \$52.62 due the late publisher on this account. It is estimated that the paper on hand is sufficient to complete the printing of proceedings to date — 128 pages of Vol. III. are already printed.

MOUND FUND.

RECEIPTS.		EXPENDITURES.	
Ladies fund,	\$39 50	Paid debt to Mr. Gass,	\$13 00
Donations,	53 25	Explorations,	74 75
		Cash on hand,	5 00
Total,	\$92 75	Total,	\$92 75

RECAPITULATION.

RECEIPTS.		EXPENDITURES.	
General fund,	\$1151 77	General fund,	\$1228 89
Endowment fund,	14 50	Endowment fund,	14 50
Ladies fund,	695 98	Ladies fund,	695 98
Publication fund,	161 35	Publication fund,	211 97
Mound fund,	92 75	Mound fund,	92 75
Deficiency,	127 74		
Total,	\$2244 09	Total,	\$2244 09

The above deficiency consists of \$77.12 due the Treasurer, and \$50.62 due the late Publisher.

ESTIMATES FOR THE COMING YEAR.

RECEIPTS.		EXPENDITURES.	
Assessments past due,	\$110 00	Janitor and door-keeper,	\$232 00
Assessments, 1882,	250 00	Interest,	122 00
Door admissions,	200 00	Coal, wood, and gas,	100 00
Initiations,	100 00	Express, freight, and postage,	75 00
Entertainments,	250 00	Insurance,	20 00
		Museum expenses,	50 00
Total,	\$910 00	Total,	\$599 00

This estimate would leave a balance of receipts over expenditures of \$311.00. I have not included expenses of publication in above estimate, but it is estimated that \$200.00 per annum would be sufficient to continue publication.

INDEBTEDNESS.

The funded indebtedness of the Academy at this time consists of a mortgage held by Mr. Pickering for \$1000, and another given Mr. Parsons for \$600, making a total of \$1600. This is, so far as I am aware, the total indebtedness of the Academy, with the exception of the advances due Treasurer and Publisher as above reported. The sum of \$90 is still due on unpaid subscription for proceedings, which will be more than sufficient to liquidate indebtedness on that account. All floating indebtedness of the Academy has been paid, and enough, and more, can easily be collected on past due assessments to reimburse the Treasurer.

RECOMMENDATION.

This properly concludes my duty as Treasurer, but in closing my official term I desire to call the careful attention of the members of the Academy to the need of providing for the care and supervision of our valuable collection. The Academy has now, for years, had the benefit of the gratuitous services of our present Curator, and the museum itself, as well as its intelligent arrangement, are largely due to his zeal and skill. The time has now arrived when provision should be made for his compensation. Some immediate action should be taken to retain his services, and I trust it will be hearty, unanimous, and, above all, liberal.

All of which is respectfully submitted.

CHAS. E. PUTNAM, *Treasurer.*

JANUARY 4th, 1882.

CURATOR'S REPORT.

LADIES AND GENTLEMEN OF THE ACADEMY:—Since the last report upon the museum, one year ago, an entire new series of cabinet cases has been put in upon the main floor of the museum room, according to the original plan, consisting of six double cases, forming alcoves around the room, and one wall-case in corresponding style, giving a space of ninety-six feet in width and seven feet in height. They are built of ash outside, with glazed doors of seventeen by forty-two inch panes, and with adjustable shelving twelve inches in depth from front to back; and they are well adapted to the purposes of the museum and at the same time are suitable for books, if it should at any time be desirable to devote that room to library purposes upon the completion of the entire building embraced in the original plan. These cases cost \$385, and constitute the best improvement made since we occupied this building. The cases formerly occupying that room have been placed down stairs, and are occupied, or are to be as fast as the work can be done, with mineral and geological collections.

The gallery contains eleven wall-cases six feet in width, the mineral cases in the library room are twenty feet, in the basement are eleven cases, and in the botanical room, one case. The whole amount of cabinet space now available for the collections is over two hundred and fifty feet in width of cases, with glass doors. In addition to these are horizontal glass cases of aggregate area of

seven or eight square yards, and ten small cases with glass fronts. Also one large and five small botanical cases with wooden doors; and a set of forty large drawers in the basement for storing specimens which it is not practicable or desirable to arrange for exhibition. The additions to the museum during the year have been about as follows:

Carved stone pipes (mound builders),	9
Copper axes (mound builders),	1
Pottery (mound builders),	350
Bone implements and ornaments (mound builders),	75
Shell implements and ornaments (mound builders),	80
Hematite implements and ornaments (mound builders),	14
Stone implements,	50
Flint implements,	350
Skulls,	21
Fishes from Pacific, presented by the Smithsonian Institution,	30 specimens
Birds' eggs, presented by Dr. Velie and others,	60 specimens

The museum now contains

FROM MOUNDS OF THE UPPER MISSISSIPPI VALLEY:

Inscribed tablets,	4	Carved stone pipes,	41
Copper axes,	26	Copper awls,	14
Copper heads,	300	Copper knives, etc.,	4
Skulls,	36		

And a miscellaneous collection of other articles.

FROM SOUTHERN MOUNDS AND BURIAL PLACES.

Vessels of ancient pottery,	600
Pipes (earthen),	10
Bone relics, awls, etc.,	120
Shell ornaments, etc.,	115
Skulls,	17
Shell beads, from different localities, over	1000
Indian and other skulls (exclusive of above),	40
Flint implements and weapons,	10000
Stone implements and weapons,	1100
Hematite implements and weapons,	32

IN NATURAL HISTORY.

Marine shells, about	800 species.	Birds' eggs,	87 species.
Land shells, about	500 species.	Fishes,	50 species.
Fresh water shells, about	400 species.	Reptiles,	100 species.
Mammals, stuffed,	12 species.	Plants,	2500 species.
Birds, stuffed,	85 species.	Skulls of animals, about	50 species.
Corals, sponges, etc.,			1 case.
Indian weapons, etc.,			1 case.
Historical relics and curiosities,			1 case.

In mineralogy, geology, and paleontology, we are still unprepared to present even an approximate report of the numbers of species or specimens. It is to be hoped that during the coming year better progress may be made in arranging and cataloguing the the collections in each department. This work becomes more and more imperatively necessary and urgent each year as the collections increase, and even now it will involve a great deal of labor.

There are also now in the museum the following collections on deposit:

INSECTS—Three large cases and many small ones belonging to our late President, J. Duncan Putnam.

BIRDS—A fine glazed walnut case, containing one hundred specimens, belonging to Dr. Wm. L. Allen; and a general collection of archæological relics, fossils, minerals, and zoological specimens, filling five large cases in the lower story, belonging to Mr. Lindley.

We are still greatly deficient in our representation of the local fauna, except the molluscs, which are quite fully represented.

The mammals, birds, reptiles, and fishes need looking after.

Of insects no collection of any importance has been made for the Academy aside from Mr. Putnam's collection, which is a very complete one of local as well as extra-limital species.

During the last year we have procured a barrel of alcohol for preserving specimens. A quantity of suitable bottles would now enable us to preserve many which can easily be obtained.

About \$75 has been expended this year in mound explorations, bringing very satisfactory returns; and there is still an opportunity for important work to be done if the means could be provided for the necessary expenses.

Respectfully submitted.

W. H. PRATT, *Curator*.

RECORDING SECRETARY'S REPORT.

LADIES AND GENTLEMEN OF THE ACADEMY:—The Recording Secretary begs leave to report.

The meetings held during the year have been as follows: Regular meetings of the Academy, 10; the average number present, 10; special meetings of the Academy, 1; regular meetings of the Trustees, 4; average number present, 5.

Regular members elected, 9; life members elected, 2; corresponding members elected, 6; members withdrawn, 3; members

deceased, 1. The present membership of the Academy is: regular members, 167; corresponding members, 250; life members, 60; total number of members, 476.

Visitors at the Academy during the year, about two thousand.

LUCY M. PRATT, *Rec. Secy.*

JANUARY 4th, 1882.

LIBRARIAN'S REPORT.

LADIES AND GENTLEMEN OF THE ACADEMY:—The Librarian begs leave to offer the following report:

By exchange and contributions only, the library has been increased during the past year over nineteen hundred volumes, besides a large number of newspapers. It now contains, including over nine hundred volumes on deposit by some of the members, about six thousand volumes and pamphlets. These constant accessions are crowding us very much, and more shelf-room is needed immediately, which could be added at the small expense of from \$6.00 to \$8.00.

As the books and periodicals are chiefly consulted at the rooms, the number on the list of books taken out but feebly represents the number really used during the year.

The library contains publications sent in exchange from almost every country on the globe in which a scientific society exists.

Respectfully submitted.

JULIA E. SANDERS, *Librarian.*

The election of officers for the ensuing year was then held with the following result:

President—DR. C. H. PRESTON.

Vice-Presidents—DR. E. H. HAZEN and H. C. FULTON.

Recording Secretary—LUCY M. PRATT.

Corresponding Secretary—DR. C. H. PRESTON.

Treasurer—FRANK A. BALCH.

Curator—W. H. PRATT.

Librarian—JULIA E. SANDERS.

Trustees for three years—C. E. PUTNAM, C. E. HARRISON, H. C. FULTON, WILLIAM RIEPE.

Trustee for one year, to fill vacancy—DR. E. H. HAZEN.

STANDING COMMITTEES FOR 1882.

Finance Committee—F. A. BALCH, E. P. LYNCH, and H. C. FULTON.

Publication Committee—MRS. M. L. D. PUTNAM, PROF. W. H. BARRIS, DR. C. C. PARRY, W. H. PRATT, and DR. C. H. PRESTON.

Library Committee—MISS JULIA E. SANDERS, J. R. BOWMAN, and MRS. E. M. PRATT.

Museum Committee—W. H. PRATT, PROF. W. H. BARRIS, PROF. D. S. SHELDON, MISS JULIA E. SANDERS, and J. J. NAGEL.

CONTRIBUTIONS TO THE MUSEUM.

1879.

- ALEXANDER, JENNIE, *Mt. Zion, Tenn.* A large stone hoe.
- ALLEN, MARY E., *Lobelville, Tenn.* Three arrow heads.
- ANNABLE, JOHN, SR., *Davenport.* A box of pebbles, etc., from the drift.
- ARRISON, C. H. Agates from Medicine Lodge Canon, Arizona.
- ASHMEAD, W. H., *Jacksonville, Fla.* Five jars of insects, scorpions, and reptiles, in alcohol
- ATKINS, JOHN S., *Davenport.* Specimens of *Corydalis cornutus*.
- ANARS, JOHN, *Lobelville, Tenn.* Ancient stone implements from Virginia.
- AYERS, MRS. DAVID B., *Jacksonville, Ills.* Three hundred volumes of miscellaneous books.
- BAKER, E. B., *Davenport.* Specimens of gneiss from Hellgate, N. Y., excavations.
- BARRIS, PROF. W. H., *Davenport.* Collection of fossils from New York and Iowa.
- BATES, JESSE, *Lobelville, Tenn.* Two arrows; one hoe.
- BAUMBACH, F. M., *Edgington, Ills.* Cuttlefish, dried specimen.
- BEASLEY, W. S., *Britt's Landing, Tenn.* Ancient stone relic.
- BELFRAGE, G. W., *Clifton, Texas.* Solpugidæ from Texas; two species.
- BENNINGTON, CHAS., *Williamsport, Tenn.* Four arrow heads.
- BERTHOUD, PROF. EDWARD L., *Golden, Col.* A collection of flint and obsidian implements from Idaho.
- BLACKWELL, E. R., *Pine Wood, Tenn.* Three arrow heads; one scraper; one hoe.
- BRACKETT, JOSEPH W., *Rock Island, Ills.* Specimen of *Belostoma grandis*.
- BROWN, ELRETTA, *Rock Island, Ills.* Three arrows; two scrapers.
- BROWN, JAMES R., *Rock Island, Ills.* Five arrows; one spear.
- BROWN, MARY S., *Pine Wood, Tenn.* Three arrow heads.
- CALKINS, J. W., *Santa Barbara, Cal.* Two specimens of fossil starfish.
- CHURCHILL, DR. S. A., *Davenport.* A collection of crania and other bones of mound-builders and Indians.
- CLEMMONS, L. W., *Pleasant Valley, Iowa.* A chicken hawk.
- CLEVELAND, D., *San Diego, Cal.* *Galeodes pallipes*; two specimens.
- CROSS, MISS GERTIE, *Davenport.* A specimen of recent coral.
- DODGE, C. A., *Albany, Ills.* A curiously deformed human femur, from the mounds.
- DOE, GEO. W., *Maquoketa, Iowa.* (Deceased.) Bequeathed to the Academy by his will, a large black walnut cabinet case, with about two thousand very choice specimens, mostly mineralogical; and designated as "Geo. W. Doe's Donation."

- DUNCAN, T. G., *Fowler's Landing, Tenn.* Ancient stone axe.
- EADS, L. T., *Davenport.* Specimen of Tellurium ore, Colorado.
- EARLE, BENJ., *Davenport.* Three lizards, and insects, from Colorado.
- ESTHER, R., *Lobelville, Tenn.* Twelve arrow heads.
- ETHRIDGE, FRANCIS E., *Harrison's Mills, Tenn.* Two arrow heads.
- EVERETT, DR. J. F., *Sterling, Ills.* Specimen of Galena limestone, ground smooth by glacial action, from a horizontal bed of the same, in Lee Co.
- FARQUHARSON, DR. R. J., *Davenport.* Bones of the ground hog.
- FEJERVARY, N., *Davenport.* Specimens of fossils from Hungary.
- FISH, THOS., *Lobelville, Tenn.* Twelve arrow heads.
- FLAGLER, COL. D. W., *Rock Island Arsenal.* Three specimens of casts of *Belemnites*, from the marl, New Jersey.
- FLOWERS, ALONZO D., *Whitfield, Tenn.* Two arrows; one stone axe.
- FRAHM, HENRY, *Davenport.* Gold quartz; four arrows; trilobites, etc.
- FRASIER, THOS. J. Fossil elephant's tooth, Clinton Co., Iowa.
- GANTT, SNOWDON S. C., *Williamsport, Tenn.* Three arrow heads.
- GOLDBERG, BENJ., *Davenport.* Gold and silver ores from New Zealand; gold lace from Chicago fire.
- GRABBE, L., *Davenport.* A large Oleander tree.
- HALL, MISS GRACE R., *Davenport.* A large collection of flint implements.
- HALL, CAPT. W. P. A large lot of flint and stone implements collected principally in Tennessee.
- HARRISON, RICHARD, *Buffalo, Tenn.* Twenty-one arrow heads.
- HASTINGS, FRANK, *Davenport.* Specimen of copper in jasper, from Calumet mine.
- HAYWARD, S. A., *Morton, Ills.* An opossum—dead—and several young ones.
- HICKOX, G. G., *Davenport.* A mink (*Putorius vison.*)
- HICKS, JAMES, *Vernon, Tenn.* Five arrow heads.
- HUDSON, CHAS., *Duck River, Tenn.* Three arrow heads.
- HUME, JOHN, *Davenport.* A living green snake.
- HUNTING, REV. S. S., *Davenport.* An army shovel from the battle-field, Petersburg, W. Va.
- JACAER, H., *Davenport.* Specimen of *Philampelus satillitia.*
- JAMES, MRS. JOSIE W. A spotted lizard. living specimen.
- JORDAN, J. B., *Davenport.* Mineralogical specimen.
- JORDAN, MRS. B., *Davenport.* Specimens of petrified wood.
- KIMBRO, MATILDA S., *Buffalo, Tenn.* Two arrow heads; one hoe.
- KIRBY, MRS., *Jacksonville, Ills.* Mantel clock, with a case made at the Deaf and Dumb Asylum.
- KRUSCHKE, G. H., *Hickory Grove.* A collection of coins and antique relics.
- LAGE, PETER, *Davenport.* Ancient stone axe.
- LANCASTER, JAMES G., *Lobelville, Tenn.* Three arrow heads.
- LANCASTER, JOHN J., *Lobelville, Tenn.* Three arrow heads.
- LATHAM, MRS. COL. ROBERT, *Lincoln, Ills.* Stalactite, Chester Co., Ills.
- LEEPER, SAMUEL J., *Lobelville, Tenn.* One flint scraper; five arrow heads.
- LEEPER, W. T., *Lobelville, Tenn.* Twenty arrow heads.
- LERCHEN, HERMAN, *Davenport.* Two goldfish in alcohol.

- LINK, BANKS, *Waverly, Tenn.* A fine large flint spear.
- LITTLER, COL. ROBERT M., *Davenport.* A human skull, and long bones, from a mound on Col. Allen's farm.
- LONGPRE, L. J., *Ontonagon, Wis.* Two ancient stone mauls, from the prehistoric copper mines.
- LORTON, GEO., *Davenport.* Specimen of ammonite.
- LOVELETT, DURELL, *Pine Wood, Tenn.* One discoidal stone.
- LOVELETT, ELI, *Pine Wood, Tenn.* Three arrow heads.
- LOW, DAVID, *Whitfield, Tenn.* Ancient stone axe.
- LUTZ, M., *Lincoln, Ill.* Specimen of cactus.
- MANCHESTER, A. W., *Big Rock, Iowa* Specimen of crinoid; fossil elephant's tooth.
- MARZAHN, MRS., *Davenport.* Specimen of fossil coral, and cone-in-cone.
- MCALLUM, WM., *Lobelville, Tenn.* Ancient stone implement.
- MCGARVEY, ANTOINE, *Davenport.* Fossiliferous sandstone (coal plants.)
- MCMASTER, S. W., *Rock Island.* Fossil shells. *Sp parryanus*
- MEAD, MISS MARY E., *Rockingham, Iowa.* A chicken hawk.
- MERRIMAN, MRS. DWIGHT. Specimens of black coral from the island of Capri, near Naples.
- MORGAN, DR. J. B., *Davenport.* Two cases of stuffed birds; twenty-five specimens.
- MURPHY, CHAS. B., *Pine Wood, Tenn.* One discoidal stone; one flint hoe.
- MYERS, DR. R. D., *Davenport.* Specimens of ores, and stalactites.
- NISSON, THEO., *Mt. Carroll, Ills.* A package of fossil corals; an old broad-axe, left-handed.
- PARKER, DR. C. C., *Fayette, Iowa.* Five species of Devonian fossils.
- PARKER, MRS. J. MONROE, *Davenport.* Two large photographs, views in Rome.
- PARRY, DR. C. C., *Davenport.* Collection of mineralogical and fossil specimens from Rocky Mountains and Lake Superior; six specimens of land shells from Saltillo, Mexico; specimens of tin ore, etc.
- PARRY, JOSEPH, *Davenport.* Ancient stone axe.
- PETERS, JOHN, *Connelssville, Pa.* Specimen of petrified wood.
- PLUMMER, MISS SARAH, *Santa Barbara, Cal.* Specimens of obsidian and lime deposit from Hot Springs, Nevada.
- PRATT, MRS. GEO. B., *Hastings, Minn.* A painting on wood, flowerpiece.
- PUTNAM, CHAS. M., *Davenport.* Package of minerals, Leadville, Colorado.
- QUALS, DAVID, *Lobelville, Tenn.* Twelve arrows; one stone implement.
- RAINEY, W. S., *Columbia, Tenn.* Ancient stone axe.
- RIEPE, A., *Davenport.* Flint arrow head, Ft. Pulaski, Mo.
- ROUQUIER, ED., *Lobelville, Tenn.* One flint and nineteen stone implements.
- SCHWARTING, BENJ., *Walcott, Iowa.* Ancient flint implements.
- SHELTON, F. J., *Linden, Tenn.* One ancient stone pipe.
- SHELTON, A. G., *Fowler's Landing, Tenn.* Buff colored chert spear, twelve inches long, Benton Co., Tenn.
- SHIPP, J. E., *Buffalo, Tenn.* Twenty arrow heads.
- SIMPSON, WM., *Davenport.* A spider. *Epeira obesa.*

- SMITH, ESTELLA L., *Duck River, Tenn.* A large discoidal stone.
- SMITH, F., *Blackhawk.* Specimens of concretions in limestone.
- SMITH, ROSA W., *Blackhawk.* One flint knife; three arrow heads.
- SMITH, ROBERT, *Davenport.* A pod of the coffee-nut tree.
- SMITH, ROBERT B., *Jacksonville, Ills.* Polished specimens of granite and marble.
- STEVENSON, DR. J. E., *Davenport.* A twenty-four lb. cannon ball which had been used in the late war; found at Corinth, Miss., buried in a stump.
- STEWART, MRS. J. W., *Davenport.* Twelve specimens of recent corals.
- STUHR, AUGUST, *Davenport.* Head of an antelope, and a large snake.
- THOMPSON, JAMES, *Davenport.* A can of preserved apples, taken in 1856, from the British ship, "Resolute," which had been abandoned in the ice of the Arctic regions.
- ULLIBARRE, SENOR JACOBO, *San Luis Potosi, Mex.* Stone pipe from a mound at that place.
- VELIE, DR. J. W., *Chicago.* Cast of stone implement, Seneca, Ills.
- VIELE, CHAS., *Evansville, Ind.* A large oil painting, framed, "Galileo before the Inquisition."
- VOLKMANN, RUDOLPH, *Davenport.* Old German papers (1807, 1815).
- WALWORTH, MISS ELLEN, *Saratoga, N. Y.* An Egyptian shoe from Cairo, and a collection of specimens illustrating the geology of that locality.
- WARREN, F. W., *Lobelville, Tenn.* One arrow; one discoidal stone.
- WATTS, SAMUEL, *Waverly, Tenn.* Ancient pottery; one specimen.
- WHITNEY, C. P., *Milford, N. H.* Collection of Tabanidæ; twelve species.
- WILDER, BURT. G., *Ithaca, N. Y.* Four specimens of amphioxus.
- WITHERSPOON, J. R., *Buffalo, Tenn.* Two arrows; one stone axe; one hoe.
- WOODWARD, MORGAN, *Davenport.* Five fossil shark's teeth, from the phosphate beds of South Carolina.
- WORLEY, MRS. DR. P. H. *Davenport.* Fresh water shells from Lake Minnetonka.
- YOUNG, HENRY C., *Glasgow, Scotland.* Collection of arachnidæ of Scotland; twenty species.

1880.

- ADAMS, A. E. B., *Rapids City, Ills.* Stone adze.
- ANDERSON, REV. S. M. Ten specimens of silurian fossils, Cincinnati, Ohio
- BALL, MRS. E., *Memphis, Tenn.* One vessel of ancient pottery; one stone celt.
- BALL, W. W., *Memphis, Tenn.* One vessel of ancient pottery.
- BALLIN, JOSEPH, *Dallas City, Ills.* Two arrow heads.
- BALLINGER, JOHN B., *Sonora, Ills.* Two flint arrows.
- BARBER, ALBERT, *Port Byron, Ills.* Three arrow heads.
- BARBER, PERRY, *Port Byron, Ills.* Two arrow heads.
- BARBER, WINNIE, *Port Byron, Ills.* Four arrow heads.
- BARKER, J. L., *Pontoosuc, Ills.* Six arrows; one stone axe.
- BARKER, ORVILLE, *Pontoosuc, Ills.* Four arrows.
- BARR S. S., *Walnut Grove, Iowa.* Collection of fresh water shells.

- BARRIS, PROF. W. H., *Davenport*. A collection of fossils, over one hundred species.
- BEAUMONT, MRS. ABBIE, *Illinois City, Ills.* Three flint implements.
- BECKWITH, ALFRED, *Orion, Wis.* Five flint arrows.
- BENNETT, DANIEL, *Sonora, Ills.* Ancient stone axe.
- BENNETT, MRS. L., *Sonora, Ills.* Ancient stone axe.
- BENNETT, MRS. CORA, *Sonora, Ills.* One arrow head.
- BENNETT, MISS MAY, *Sonora, Ills.* One arrow head.
- BENNETT, MISS SUSAN, *Sonora, Ills.* Two arrow heads.
- BENNETT, MISS PARTHENIA, *Sonora, Ills.* One arrow head.
- BERMAN, LEWIS, *Dallas City, Ills.* Two arrow heads.
- BERMAN, MARGARET, *Dallas City, Ills.* Two arrow heads.
- BERTHOUD, PROF. E. L., *Golden, Col.* A collection of flint and obsidian implements; and some charred wheat from the Swiss Lake dwellings.
- BLACK, S. F., *Pontoosuc, Ills.* One stone axe.
- BLACK, Z., *Pontoosuc, Ills.* One stone hoe.
- BLUMER, REV. AD., *Geneseo, Ills.* A carved pipe, representing an elephant, from a mound on the farm of P. Haas, Louisa Co., Iowa; also, a mound-builder's skull from a mound in Henry Co., Ills.
- BLUMER, MRS. REV. AD., *Geneseo, Ills.* An ostrich egg.
- BOERSTLER, JOHN, *Gilead, Ills.* Stone implement.
- BOWMAN, DR. E. H., *Davenport*. Cast-off snake skin.
- BOYD, MR., *Cassville, Wis.* Specimen of calc. spar.
- BOYNTON, GEO. H., *Davenport*. Specimens of fossil coal plants, from railroad excavations at Wyoming bluff.
- BRANNAN, DAVID, *Gilead, Ills.* One arrow head.
- BRAYTON, B. B., *Davenport*. Fossil coal plants in "soap-stone" clay, from Guthrie Co., Iowa.
- BRIGGS, M. H., *Kilbourn, City, Wis.* Five flint implements.
- BRISTOL, KATE, *Thompson, Ills.* One flint arrow head.
- BROUGHTON, ANNIE, *Gilead, Ills.* One stone gouge.
- BROUGHTON, JOHN, *Gilead, Ills.* Two arrow heads.
- BROUGHTON, MARY, *Gilead, Ills.* One flint implement.
- BROUGHTON, WM. A., *Gilead, Ills.* One flint spear, twisted.
- BROWN, T. A., *Merrimac, Wis.* Four flint implements.
- BROWN, CLARA, *Pontoosuc, Ills.* Small figure, carved in stone.
- BROWNLIE, JAMES, *Long Grove*. The first door-latch used in Scott county, north of the city, made in 1839, from the horns of a deer.
- BUFFUM, S. R., *Andalusia*. Ancient stone axe.
- CHRISTIANSSEN, DR. E., *Davenport*. Nine specimens of pearls, natural form.
- CLEMMONS, L. W., *Pleasant Valley*. An owl.
- CLIFFORD, CAPT. J. C., *Rock Island Arsenal*. Specimen of Conn. river sandstone, containing fossil tracks.
- COOK, BAILEY, *Davenport*. Fragment of fossil fish bone.
- COZATTE, JAMES, *Davenport*. A pelican and a loon; fresh specimens.
- CULVER, L. M., *Wauzeka, Wis.* Two specimens of copper; one stalagmite.
- CULVERWELL, JAMES, *Davenport*. Six specimens of Indian shell work.

- DAHM, CHRISTIAN T., *Davenport*. A collection of European ancient stone implements, fossils, and coins.
- DAVIES, MRS. J. L., *Davenport*. A pair of globes—terrestrial and celestial.
- DENNISON, WM. *Rapids City, Ills.* Four flint implements.
- DERBY, DR. W., *Wyalusing, Wis.* One flint implement; one copper half cent, 1804.
- DOTY, MATTIE M., *Lone Rock, Wis.* Two flint implements.
- EADS, L. T., *Davenport*. Quartzite skinning knife, from Wyalusing, Wis.
- EARHART, ADAM, *Rapids City, Ills.* Two flint implements.
- EARHART, EFFIE, *Rapids City, Ills.* One small celt.
- EARLE, JERRY, *Grayson, Ark.* One discoidal stone; one celt.
- EARLE, BENJAMIN, *Grayson, Ark.* One vessel of mound pottery—form of a fish.
- EARLE, MAJ. J. F., *Grayson, Ark.* One vessel of mound pottery; basin.
- EARLE, MRS. L. R., *Grayson, Ark.* One vessel mound pottery, ornamented.
- EARLE, MISS LOUISA R., *Grayson, Ark.* One vessel of mound pottery.
- ELLIOTT, W. H., *Ross Co., Ohio.* A collection of twenty-six flint and stone implements of that locality.
- ESEKE, BERNARD, *Davenport*. Two cast iron cannon balls, from the bed of the Mississippi river near the head of Rock Island, found in excavating the channel.
- ESPY, MRS. L. H., *Dyersburg, Tenn.* One perforated discoidal stone; two arrow heads.
- EUHBERG, MRS. J. L., *Memphis, Tenn.* One vessel of ancient pottery.
- FARQUHARSON, THOMAS, *Davenport*. Specimens of clays from Guthrie Co., containing impressions of coal plants.
- FIEDLER, ANDREW, *Hardin Ills*
- FIEDLER, HENRY, *Hardin, Ills.*
- FIEDLER, JOSEPH, *Hardin, Ills*
- } One stone axe; sixteen arrows.
- FIROR, V. M., *Davenport*. Fragments of cranium of American elephant; found in Manatee Co., Florida, in 1870.
- FLAGG, M., *Dallas City, Ills.* A long white flint knife,
- FLINDT, C., *Port Byron, Ills.* Ancient stone implement (adze.)
- FORD, GOLD, *Thompson's Point, Tenn.* Two ancient stone implements.
- FORSYTH, J. L., *Wright's Point, Ark* Two specimens ancient pottery.
- FOWLER, MARGARET, *Illinois City, Ills.* One flint arrow.
- FREELAND, GEORGE, *Rapids City, Ills.* One flint knife; one arrow.
- FREELIG, MISS NELLIE, *Muscatine.* Collection of Devonian corals.
- FRIEND, R. W., *Pecan Point, Ark.* One vessel of ancient pottery; one ancient stone implement.
- FRIEND, ROBERDIE, *Pecan Point, Ark.* One vessel of ancient pottery.
- FRIEND, MRS. R. W., *Pecan Point, Ark.* Three vessels of ancient pottery.
- FRIEND, MISS VIRGIE, *Pecan Point, Ark.* One vessel of ancient pottery.
- FRIEND, MISS EMMA, *Pecan Point, Ark.* One vessel ancient pottery.
- FULTON, A. C., *Davenport*. Relics of slavery, yoke, hobbles, and shackles.
- GASS, REV. J., *Davenport*. Four carved stone pipes, collected from ancient mounds; also a copper axe and other relics.

- GEISLER, EMIL, *Davenport*. Relic from the "Schiller" wreck.
- GIFFORD, MRS. IRA, *Davenport*. Specimen of petrified wood from "Bad Lands," Dakota.
- GIRDON, CAPT. GEO. W., *Galena, Ills.* Specimen of shell rock limestone, Allamakee Co., Iowa; polished stone ball from Yellowstone river.
- GLASPELL, ELMER, *Davenport*. Quartz implement, from Cook's quarry, broken.
- GORHAM, JOEL, *Andalusia, Ills.* One arrow head.
- GORDON, T. M. *Gilead, Ills.* One flint implement.
- GRAHAM, DAVID. *Rapids City, Ills.* One stone axe; six arrows.
- GRAHAM, JANE, *Rapids City, Ills.* Flint knife; two arrows.
- GRONEN, W. OTTO, *Davenport*. Head of rattlesnake, from Texas; trilobites.
- GRONEN, MRS. SOPHIE, *Davenport*. A mound-builders' pipe, sand stone, bird form; also, a very large copper bead; both from a mound in Louisiana Co
- GUMBER, ANDREW, *Rapids City, Ills.* Ancient stone axe.
- HAINES, MRS. MARY P., *Richmond, Ind.* A collection of twenty-three species of cretaceous fossils, from Ft. Worth, Texas.
- HALBERT, MRS. MARY, *Buffalo, Iowa*. Specimen of clay-iron-stone.
- HALL, ELLA, *Davenport* One flint knife.
- HALL, CAPT. W. P. About one thousand flint and stone implements, and a large collection of pottery and other relics from the ancient mounds in Arkansas and Tennessee.
- HAND, GALEN, *Pontoosuc, Ills.* One stone axe.
- HAND, ROBERT, *Illinois City, Ills.* Four arrow heads.
- HARRISON, CHARLES E., *Davenport* Two arrow heads; and a collection of Silurian fossils from the "Old Fort," Price's Hill, Carroll Co., Ky.
- HARVEY, THOMAS. *Eagle Corners, Wis.* Round stone; one flint.
- HASE, CATHERINE J., *Ashburn, Mo.* Three arrow heads.
- HASE, MAHALA, *Ashburn, Mo.* Two arrow heads.
- HEINZ GEORGE, *Davenport*. Two flint implements.
- HERWIG, ADOLPHUS, *Pontoosuc. Ills.* Fifteen flint implements.
- HERZBERG, M., *Memphis Tenn.* One vessel ancient pottery.
- HIGHM, CHARLES, *Mosier, Ills.* One arrow head.
- HOFFMAN HENRY, *Davenport* "Banner-stone" found on the Cook farm.
- HOGG, EDMUND, *Brim's P. O., Ky.* One discoidal stone.
- HOLMES, W. H., *Davenport*. Specimens of iron ore from Wisconsin.
- HOUSE. ORVILLE, *Metropolis, Ills* Four ancient stone implements.
- HOWARD, ROSETTA, *Illinois City, Ills.* Five flint arrows.
- HUGHES, WILLIAM. A large card-plate, section, and full description of the ship Great Eastern, published many years ago.
- HUNTING, REV S S. Modern Indian pipe, of catlinite, from Minnesota.
- JACKSON, MRS. C. M., *Illinois City, Ills.* Three flint implements.
- JACKSON, M. Twenty-six flint implements.
- JARVIS, HARRY, *Richland City, Wis.* Three arrow heads.
- JENKINS, GEO. W., *Davenport*. Specimens of sandstone used in new State House, Des Moines,

- JENKINS, H. S., *Davenport*. An indenture of apprenticeship executed at Penryn, county of Cornwall, June 4th, 1805.
- JOHNSON, ELIZABETH, *Illinois City, Ills.* One arrow head.
- JOHNSON, JOSEPH, *Illinois City, Ills.* One arrow head.
- JOHNSON, JOHN, *Thompson, Ills.* Square red pipe; one arrow.
- JOHNSON, HENRY, *Thompson, Ills.* Two flint implements.
- JONES, CAPT. W. A., *U. S. Engineers.* Collection of thirty mineralogical specimens from the Yellowstone, with glass case.
- KEATON, ELLA A., *Bay, Ills.* One fine flint knife.
- KELLOGG, DR. C. F., *Charlotte, Iowa.* A package of fossils, Clinton Co.
- KERNS, JOHN, *Merrimac, Wis.* Four flint implements.
- KIEL, J. B., *Montrose, Iowa.* Collection of flint and stone implements.
- KING, WILLIAM, *Buffalo, Tenn.* Specimen of galena.
- KOCH, FRANCIS J., *Davenport.* An herbarium, containing fifteen hundred specimens of plants, collected in Pennsylvania and New Jersey.
- KRUSCHKE, G. W. Specimen of volcanic rock from shore of Lake Michigan.
- KULP, DR. W. O., *Davenport.* Two microscopic sections of a human tooth.
- KURMEIER & RASCHER, *Davenport.* Specimens of a tin roof and spouting broken by hailstones, July 8th, from the roof of a building at Le Claire.
- LEACH, JAMES N., *Eagle Corners, Wis.* Two flint implements.
- LERCHEN, HERMAN, *Davenport.* Steel engraving, portrait of Humboldt.
- LINDAHL, PROF. JOSUA, *Augustana College, Rock Island, Ills.* *Helix pomatia* dissected, in alcohol.
- LOGAN, JAMES L., *Pontoosuc, Ills.* Small stone axe; five arrows.
- LUCAS, JOHN, *Thompson, Ills.* One flint arrow head.
- MARTIN, THOS. M., *Illinois City, Ills.* One flint knife.
- MAURER, MARY, *Rapids City, Ills.* Two arrow heads.
- MAURER, JOHN, *Rapids City, Ills.* Small stone axe; stone ball; two flint implements.
- McKOWN, GILBERT B., *Port Andrew, Wis.* One large white arrow.
- MEISSNER, A., *Davenport* A specimen of water bug.
- MERRIMAN, MRS., *Jackson, Mich.* A specimen of kelp, from the Caribbean Sea; a shell from Martha's Vineyard, *Voluta musica*; skull of a negro murderess.
- MORRIS, JAMES J., *Pontoosuc, Ills.* Small stone axe.
- MORRIS, EDWARD G., *Pontoosuc, Ills.* Small stone axe, and discoidal stone.
- MORRIS, C. F., *Crittenden county, Ark.* One vessel of ancient pottery.
- MORRIS, MRS. L. A., *Pecan Point, Ark.* One vessel ancient pottery.
- MORRIS, MRS. M. One vessel of ancient pottery.
- NAGEL, CHARLES, *Rockingham.* Ancient stone axe; four arrows.
- NEFF, EDWARD, *Orion, Wis.* }
- NEFF, ALICE, *Orion, Wis.* } A collection of eighteen flint implements.
- NEWCOMB, DR. WESLEY. *Ithaca, N. Y.* A collection of rare butterflies.
- NICE, R. B., *Millville, Wis.* One flint arrow head.
- OEHLE, AMBROSE, *Belleville, Iowa.* Two flint implements.
- PARKER, J. MONROE, *Davenport.* A pair of Roman ox horns, mounted.
- PARKER, MRS. J. M. AND MRS. MERRIMAN. Four cabinet cases, purchased by them from the Y. M. C. Association.

- PARKS, EVA S., *Merrimac, Wis.* Two flint implement.
- PARKS, FREDERICK, *Merrimac, Wis.* Two flint implements.
- PARR, MRS. CATHARINE, *Hale's Point, Tenn.* One polished and perforated ancient stone implement.
- PARRIS, SIDNEY, *Oldham, Ark.* Three stone axes.
- PARRY, DR. C. C., *Davenport.* Specimens of quartz containing garnets, from Westford, Conn.; and pieces of meteorite, from San Bernadino, California.
- PARSONS, HORACE, *Hamilton, Ills.* One arrow head.
- PARSONS, WALTER, *Hamilton, Ills.* Two arrow heads.
- PEPPERS, PAUL, *Friars' Point, Ark.* One piece ancient pottery.
- PERRY, MRS. E. A. W., *Keokuk, Iowa.* A piece of the Emmett county, Iowa, meteorite, which fell May 10, 1879; also two photographs of meteorite.
- PLEASANTINA, MARY A., *Mosier, Ills.* One arrow head.
- PLUMMER, DR. S. C., *Rock Island, Ills.* One case stuffed birds, twenty-seven specimens.
- POPE, P. V., *Davenport.* Indian pipe.
- PORTER, MRS. DR. M. W., *Davenport.* A wax model of Chinese lady's foot.
- PRATT, MRS. E. M., *Davenport.* Five flint implements
- PRUDENT, PERRY, *Rapids City, Ills.* Small stone axe.
- PUTNAM, J. DUNCAN, *Davenport.* A chimney swallow's nest, and one of the young in alcohol.
- RAND, CHAS., *Pontoosuc, Ills.* Flint implement.
- RITCHIE, WM. M., *Port Andrew, Wis.* One flint arrow head.
- ROBERTS, ELISHA B.,
- ROBERTS, ISAAC J.,
- ROBERTS, FLORETTA,
- ROBERTS, MINNIE,
- ROBERTS, MOSES,
- ROBERTS, ERNEST,
- ROBERTS, SARAH,
- } *Andalusia, Ills.* Fifty arrow heads; one stone
axe.
- ROBINSON, ALICE, *Andalusia, Ills.* Three arrow heads
- ROCKEL, CAROLINE, *Dallas City, Ills.* Two arrow heads.
- ROCKEL, EDWARD, *Dallas City, Ills.* Two arrow heads.
- ROCKEL, MARY, *Dallas City, Ills.* Two arrow heads.
- ROCKEL, SOPHIA, *Dallas City, Ills.* Two arrow heads.
- ROCKEL, WILLIAM, *Dallas City, Ills.* Two arrow heads.
- ROGGENDORFF, DENICE, *Thompson, Ills.* Two flint implements.
- ROGGENDORFF, VICTORIA, *Thompson, Ills.* Two flint implements.
- RONNER, KATHERINE, *Sonora, Ills.* Ancient stone axe; one arrow.
- ROOK, WILLIAM, *Princeton, Iowa.* Two flint implements.
- ROSA, G. W., *Bay, Ills.* Ancient stone axe.
- ROSA, LILLIE, *Ray, Ills.* Two arrow heads.
- ROSS, G. G. Frame for the slab of dendritic standstone.
- ROUQUIER, ED., *Lobelville, Tenn.* Specimen of galena.
- SACKMAN, PAUL B., SR., *Gilead, Ills.* Two flint arrows.
- SACKMAN, PAUL B., JR., *Gilead, Ills.* Three flint implements.

- SANDS, M., *Davenport*. A bird's nest.
- SAUERS, WILLIE C. Two flint implements.
- SCHEIBEL, JACOB, *Port Byron, Ills* Large stone axe.
- SCHEIBEL HENRY, *Port Byron, Ills*. Four flint knives.
- SCHRAMM, THEO, *Pontoosuc, Ills* One stone axe.
- SCHROEDER, JOHN Alligator's teeth, four specimens.
- SCHULTZ, LEWIS, *Dallas City, Ills* One flint spear; one axe.
- SCHULTZ, HENRY, *Dallas City, Ills*. Two arrow heads.
- SCHULTZ, FRANK, *Dallas City, Ills* Six arrow heads.
- SCHULTZ, SOPHIA, *Dallas City, Ills*. Three arrow heads.
- SCHWINGLE, JOHN C, *Port Andrew, Wis* Two flint arrows.
- SEELY, CHAS., *Wauzeka, Wis*. One flint arrow head.
- SEELY, P., *Woodman, Wis*. Five flint implements.
- SELLECK, GEORGE, *Millville, Wis*. Two flint arrow heads; one specimen stalactite, iron pyrites.
- SHEPARD, MRS MARIA. An ancient glass (or porcelain) pocket flask brought over from Hanover to England in the early part of the seventeenth century.
- SHEPHERD, MARY B., *Illinois City, Ills*. One flint implement.
- SHEPARD, PROF. C. U, *Charleston, S. C*. A fine collection of minerals and fossils—labeled—seventy-five specimens.
- SHURTLEFF, JOB, *Rapids City, Ills*. Large flint knife, broken.
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| SIEMS, ALICE, | } | <i>Pontoosuc, Ills</i> . One stone axe; forty-three arrows. |
| SIEMS, HIRAM, | | |
| SIEMS, MUNSON, | | |
| SIEMS, J. R., | | |
| SIEMS, PERRY, | | |
| SIEMS, SARAH, | | |
- SMALLWEED, WILLIAM, *Pontoosuc, Ills*. One flint knife.
- SMITH, J. M., *Paducah, Ky*. Ancient stone implements.
- SMITH, O. J., *Hale's Point, Tenn.* } Two very large ancient earthen pots from
- SMITH, O. C., *Hale's Point, Tenn.* } the mounds; capacity $1\frac{1}{2}$ bush. each.
- STEARNS, MRS. DE WITT. Shell of a palm fruit, West Indies.
- STEELE, GEORGE D., *Rapids City, Ills*. Two arrow heads.
- STETLER, CORNELIUS, *Eagle Corners, Wis*. Two stone implements.
- STODDARD J. H., *Fulton, Ills*. Two flint implements.
- STODDARD, EDITH E., *Fulton, Ills* Two flint implements.
- STONE, JOHN R., *Merrimac, Wis*. One flint arrow head.
- SUPPEL, HENRY J, *Pontoosuc, Ills*. Two flint implements.
- SWINEY, DANIEL, *Ramelton, Ireland*. Specimens of sea urchins, *Echinus lividus*, with the rock in which they burrowed.
- SWISHER, I L., *Port Byron, Ills*. Flint arrow and large flint knife.
- SWISHER, S. L., *Port Byron, Ills*. Flint arrow and large flint knife.
- SWISHER, MINNIE H., *Port Byron, Ills*. Flint arrow, twisting.
- SWISHER, CHAS. L., *Port Byron, Ills* Two arrows and one knife.
- SWISHER, FRANK L, *Port Byron Ills*. Two arrows and one knife.
- TATE, ALICE, *Rapids City, Ills*. One flint knife.

- TATE, GEO., *Rapids City, Ills* Stone axe; plano-convex.
- TATE, MARY, *Rapids City, Ills.* Two flint arrows, from Kentucky.
- TATE, ROBT., *Rapids City, Ills.* Flint spear head.
- TAYLOR, A., *Dallas City, Ills.* Ancient stone axe.
- THANNERT, ALBERT *Pontoosuc, Ills.* One flint spear.
- THANNERT, HENRY, *Pontoosuc, Ills.* One stone axe; ten flint implements.
- THANNERT, WILLIAM. *Pontoosuc, Ills.* One arrow.
- THOMPSON, J. H., *Hale's Point, Tenn.* Ancient stone implement.
- THOMPSON, J. H. JR., *Hale's Point, Tenn.* One specimen, ancient pottery.
- TIMMS, V. T., *Nodena, Ark.* Stone axe; ancient pottery.
- TRUMLEIGH, JOSHUA, *Montrose, Iowa.* Four flint implements.
- TUBBS, WILBER, *Port Byron, Ills.* Two arrow heads.
- TYLER, LEWIS, *Merrimac, Wis.* Three flint implements.
- URBAN, ALBERT, *Pontoosuc, Ills* One stone axe; one arrow.
- URBAN, FRED., *Pontoosuc, Ills,* Four arrow heads.
- URICH, BENJAMIN, *Pontoosuc, Ills* Six arrow heads.
- VANDEVER, MISS LIDA, *Andalusia, Ills.* Ancient stone implement.
- VELIE, DR J. W., *Chicago* Specimen of young fish, in alcohol—*Ariopsis felis*; Linn.
- VOGEL, L. A., *Star Lime Works, Kentucky.* Ancient stone implements.
- WALKER, ELLA, *Pontoosuc, Ills.* Two arrow heads.
- WALKER, F. H. B., *Pontoosuc, Ills.* One stone axe.
- WALTON, W. H., *Richland City, Wis* Six flint implements.
- WAYNE, MRS. S., *Wauzeka, Wis* One flint arrow head.
- WELLER, FRED., *Richland City, Wis.* Specimen lead ore; one arrow.
- WELLS, LEMUEL, *Pontoosuc, Ills.* Two arrows; one stone axe.
- WILCOX, FRANK. *Pontoosuc, Ills.* Two arrow heads.
- WILCOX, LEWIS, *Pontoosuc, Ills.* Five arrow heads.
- WILCOX HARRIET, *Port Byron, Ills* One arrow head.
- WILLIAMS, SARAH *Rapids City, Ills* Two large flint knives.
- WORLEY, DR P. H., *Davenport.* Collection of thirty-nine coins.
- WRIGHT, W. G. *San Francisco, Cal.* A box of small shells; specimen of soft stone from the "Colorado Desert."
- ZIGRANG, WILLIAM, *Bachtown, Ills.* Fifteen flint implements.

1881.

- BARBER, PROF. E. A., *Philadelphia, Pa.* Two "fairy," or "elfin pipes," from England; type of 1600 to 1680.
- BERTHOUD, CAPT. E. L., *Golden. Col.* A collection of minerals; twenty-five species from Colorado.
- BOERSTLER, JOHN, *Gillead, Ills.* Collection of hematite specimens; a lot of flint implements (by exchange).
- BOWMAN, DR. S. C., *Inland, Iowa.* Seven specimens of birds, mounted; one specimen of gopher.
- BRADDON, MR., *Davenport.* Specimen of kawi gum, New Zealand.

- CALKINS, W. W., *Chicago, Ills.* A collection of recent shells; fragments of pottery and human bones, from Florida mounds.
- CAMPBELL, B., *Cliff Dale, Ills.* One stone mortar; one stone axe.
- CLAYPOLE, PROF. E. W., *Antioch College, Ohio.* A cast of *Glyptodendron eatonense*, Clinton group, Preble county, Ohio; the earliest relic of tree life yet known.
- COLLAMER, NEIL, *Davenport.* A carved stone pipe; two copper beads, from a mound at New Boston, Ills.
- DIXON, CHAS S, *Davenport.* A birch bark canoe, made by the Indians in Minnesota in 1880.
- EICKHOFF, HERMANN, *Davenport.* A collection of archæological relics from mounds in Germany, with some fossils from there; one hundred and forty coins.
- FARQUHAUSON, DR. R. J., *Davenport.* Casts of inscribed stones, found at Piqua, Ohio.
- FOWLER, WILLIAM, *Illinois City, Ills.* Several arrow heads.
- FOWLER, MISS N, *Illinois City, Ills.* One arrow head.
- FOWLER, MISS R. A., *Illinois City, Ills.* A large fine "hoe" of white chert; two arrows.
- GIFFORD, MRS. I. M., *Davenport.* A specimen of turquoise; a stone hammer, from Arizona.
- GILBERT, G. E. W., *Honeoye, N. Y.* A pre-historic copper axe, or chisel, found by him in 1856, on the bank of the Mississippi, at Gilberttown.
- GRATNER, HENRY, *Davenport.* A large piece of fossil wood, found at the depth of sixty-three feet, at Oakdale cemetery.
- HAREL, PRIOR S., *Golden, Miss.* One vessel ancient pottery.
- HARRISON, CHAS E. *Davenport* A pair candle snuffers (antique).
- HILLS, MRS. FANNIE, *Davenport.* Specimen of the bark of the "silk tree," used for clothing, etc.
- HUGHES, WILLIAM, *Davenport.* A cane made from the wood of the big tree, sixteen feet in diameter, brought from California to the international exhibition, Philadelphia, 1876.
- JACKSON, M. E., *Davenport.* Peat and fossil wood, from thirty-eight feet below the surface.
- MARTIN, EDDIE, *Illinois City, Ills.* Several arrow heads.
- PECK, DR W. F. *Davenport.* A brick from the wall of Libby prison; splinter from the stockade of same; pebbles from the graves of Powhatan and Pocahontas.
- PENCE, MAMIE A, *Valley City, Ills.* Two flint implements.
- PETERSEN, JENS THOMAS, *Illinois City, Ills.* Large white flint knife.
- PRICE, HON HIRAM. "Cargo samples, 1880, imported sugars."
- PUTNAM, GEO R., *Davenport* Two salamanders.
- REYNOLDS, STEPHEN A. D., *Valley City, Ills.* Two flint implements.
- RIDDLE DANIEL, *Hale's Point, Tenn.* One earthen pipe, from mound.
- RONE, JEFF, *Randolph, Tenn.* One vessel ancient pottery.
- SANDERS, MRS. M. A., *Davenport.* A fine specimen "glass sponge," *Euplectella speciosa*, Florida coast.

- SANDERS, MISS JULIA E., *Davenport*. A box of sea shells.
- SCHROEDER & BRANDT, *Davenport*. Specimens of petrified coal plants, from quarry near Buffalo, Iowa.
- SEAYER, REV. WM., *Dorchester, Mass.* A package of fossil shark's teeth and fragments of bones.
- SHEPHERD, R. T., *Monroe, Ohio*. Twenty-three arrow heads, from New Jersey.
- SHIPP, DR. J. E., *Shipp's Landing, Tenn.* A mastodon tooth.
- SIMPSON, R. F., *Davenport*. A salamander, living specimen.
- SIMPSON, J. S., *Davenport*. A black bat; and an insect from the potato plant.
- SIMS, DR. J. C., *Double Bridges, Tenn.* Ancient stone implement.
- SMITH, MRS. MARTHA, *Hale's Point, Tenn.* One large vessel, mound pottery; one white discoidal stone.
- SMITHSONIAN INSTITUTION, *Washington, D. C.* A collection of fishes of the Pacific coast, about thirty species.
- SNYDER, DR. J. F., *Virginia, Ills.* Six specimens ancient hornstone discs (shovels?), from Beardstown.
- SUSEMIEHL, MR., *Davenport*. A pully block from a ship.
- SWEET, D. E., *Pipestone City, Minn.* Specimen of catlinite.
- THOMPSON, NEWTON, *Hale's Point, Tenn.* One stone axe; two flint implements.
- THOMPSON, MATTIE M., *Hale's Point, Tenn.* Skinning knife; hammer stone; and arrows.
- TRIPP, G. W., *Hale's Point, Tenn.* One stone hatchet.
- VELIE, DR. J. W., *Chicago, Ills.* A collection of bird's eggs, of southern water fowl.
- WOOD, G. W., *Hale's Point, Tenn.* One discoidal stone.
- WOOLMAN, E., *Hot Springs, Ark.* Dendritic stone from there.



PAPERS PRESENTED.

THE DATE OF PRESENTATION ACCOMPANYING EACH PAPER.

CONTRIBUTION TO THE FLORA OF IOWA.—No. V.

BY J. C. ARTHUR.

Read before the Davenport Academy of Sciences at the June meeting, 1882.

The following list comprises the well authenticated additions to the previously published lists of Iowa plants. The material for it has been contributed by R. I. Cratty of Estherville, Emmett Co.; E. W. Holway of Decorah; John Leiberg late of Seney, Plymouth Co.; Dr. Geo. E. Ehinger of Keokuk; Prof. C. E. Bessey of Ames; Mrs. M. C. Carter of Hesper, Winneshiek Co.; M. E. Jones of Salt Lake City, Utah; and the writer.

- 192^a *Amorpha microphylla*, Pursh. Palo Alto and Clay Cos.
244^c *Potentilla palustris*, Scop. Emmett Co.
305^a *Cicuta bulbifera*, L. Emmett Co.
430^a *Helianthus Maximiliani*, Schr. Emmett Co.
455^a *Artemisia annua*, L. Keokuk.
467^a *Senecio palustris*, Hook. Spirit Lake and Emmett Co.
520^b *Utricularia intermedia*, Hay. Emmett Co.
606^b *Mertensia paniculata*, Don. Decorah.
607^b *Echinosperrum Redowskii*, Lehm., var. *occidentale*,
Watson. Decorah.
691^a *Rumex obtusifolius*, L. Decorah.
710^a *Euphorbia commutata*, Engelm. Decorah.
715^a *Ulmus racemosa*, Thomas. Waverly and Charles City.
757^a *Salix myrtilloides*, L. Emmett Co.
781^a *Potamogeton Illinoensis*, Morong. Emmett Co.
782^b *Potamogeton perfoliatus*, L., var. *lanceolatus*, Robbins.
Emmett Co.
784^a *Triglochin maritimum*, L., var. *elatum*, Gr. Emmett Co.
784^b *Scheuchzeria palustris*, L. Emmett Co.
787^b *Sagittaria cristata*, Engelm. ined. Emmett Co.

- 834^a *Juncus Balticus*, Deth. Emmett Co.
 857^a *Eriophorum gracile*, Koch, var. *paucinervium*, Engelm.
 Emmett Co.
 860^a *Carex siccata*, Dew. Emmett Co.
 867^a *Carex chordorhiza*, Ehrh. Emmett Co.
 867^b *Carex Deveyana*, Schw. Spirit Lake.
 868^a *Carex stellulata*, L. Emmett Co.
 879^b *Carex straminea*, Schk., var. *festucea*, Boott. Grinnell
 and Ames.
 883^a *Carex limosa*, L. Emmett Co.
 892^b *Carex pubescens*, Muhl. Grinnell.
 893^d *Carex comosa*, Boott. Emmett Co.
 897^b *Carex retrorsa*, Schr. Emmett Co.
 897^c *Carex monile*, Tuck. Grinnell and Emmett Co.
 900^a *Leersia lenticularis*, Mx. Montrose.
 920^a *Calamagrostis stricta*, Trin. Emmett Co.
 934^b *Glyceria aquatica*, Smith. Plymouth Co., and Hesper.
 935^a *Poa cæsia*, Smith. Hancock Co.
 961^a *Beckmannia erucæformis*, Host. Plymouth Co.
 962^a *Panicum filiforme*, L. Keokuk.

The following are descriptions of species not given in the 5th edition of Gray's Manual.

AMORPHA MICROPHYLLA, *Pursh*.—Nearly smooth, dwarf; leaves with very short petioles, obtuse at both ends; spikes short, solitary; calyx nearly naked, pedicellate, teeth all very acuminate; legumes 1-seeded. (*A. nana*, Nutt.) —On the banks of the Missouri. From 1 to 2 feet high; flowers purple and fragrant. A very elegant little shrub. *Pursh's Fl. Amer. Sep.*, II, 466.

This compact little shrub is abundant on the dry prairies of north-western Iowa. It flowers in May, and not in July and August as stated by Pursh. The leaflets are oblong, conspicuously punctate, and in 10–20 pairs.

HELIANTHUS MAXIMILIANI, *Schrad.*—Stem strigose-scabrous, branched; leaves alternate (those of the branches sometimes opposite), lanceolate, entire or nearly so, tapering to each end, acuminate, very scabrous and often canescent-strigose on both sides, the lower petioled; scales of the involucre lanceolate-subulate, much attenuate, strigose-canescant; pappus of two lanceolate slightly fringed chaffy scales. —Prairies. Missouri, Texas. *Torrey and Gray's Fl. N. Am.*, II, 325.

In Meehan's "Native Flowers and Ferns of the United States," where this species is finely figured, the range is said to be "probably

confined to the hot and dry regions extending west of the Mississippi," and it is stated that "Lawrence, Kansas, seems to be about its northern boundary." It is, however, plentiful in Emmett County of this state, fully 300 miles further northward.

ARTEMISIA ANNUA, *L.*—Leaves twice pinnatifid, glabrous; divisions of the lower leaves lanceolate, incised, of the upper linear, pectinately pinnatifid; flowers panicled, globose, nodding.—Northern Persia, Siberia, and China.

Linnaeus' Syst. Veg., 16th ed., *cur. Sprengel.*

This was probably first brought to Keokuk as a cultivated plant, but has become a common weed.

ECHINOSPERMUM REDOWSKII, *Lehm.*, var. *occidentale*, *Watson.*—The American plant is less strict, at length diffuse, and the tubercles or scabrosities of the nutlet are sharp instead of blunt or roundish as in the Asiatic plant.—Plains. Saskatchewan and Minnesota to Texas, and west to Arizona and Alaska. *Gray's Synop. Fl. N. Amer.*, 190.

The typical form of this species is a native of Northern Asia.

POTAMOGETON ILLINOENSIS, *Morong.*—Floating leaves opposite, thick, coriaceous, oval or ovate, 2-3 inches long by $1\frac{1}{2}$ broad, 19-23 nerved, on short petioles, submerged leaves comparatively few, oblong-elliptical, acute at each end, usually ample (the largest nearly 8 inches long and $1\frac{1}{2}$ wide), nearly or quite sessile, the uppermost opposite; stipules free, obtuse, strongly bicarinate, about 2 inches long; peduncles often clustered at the summit of the stem; spikes about 2 inches long, densely flowered; fruit roundish obovate, 3-keeled on the back, the middle keel prominent, and sometimes shouldered at the top, flattened and slightly impressed on the sides, obtuse or occasionally pointed at the base, the style short and nearly facial.—Allied to *P. lucens*, *L.* in habit, but with larger fruit, and in foliage quite distinct. Mississippi River bottoms near Oquawka, Ill., Englewood, Ill. *Bot. Gazette*, V, 50, 1880.

SAGITTARIA CRISTATA, *Engelm. ined.*—Flowers only of the lowest whorl fertile; fruit-heads much larger than in *S. graminea*; achenia broad, with a conspicuous horizontal style, and crested back and sides.—Dr. Engelmann adds that this is near *S. graminea*, Michx., and is perhaps only a variety of it, although the only other *Sagittaria* with such crests to the achenia is *S. natans*, Michx. Further observations are needed to eventually place it correctly. *Letter dated March 15th, 1882.*

BECKMANNIA, *Host.*—Panicle racemose, contracted; spikelets compressed, 2-flowered, the upper floret an abortive rudiment; glumes obovate, compressed boat-shaped, equal, a little shorter than the flower, pointless; palea membranous, the lower ovate, mucronate, 3-nerved, the upper 2-nerved, bifid; grain free.

B. ERUCÆFORMIS, *Host.*—Culms stout, $1-3\frac{1}{2}$ feet high, with the sheaths glabrous; ligules elongated; leaves linear, 4-8 inches long, flat, scabrous; panicle 4-12 inches long, erect, strict, secund, the short crowded branches

densely flowered from the base, glabrous; spikelets sessile, imbricately arranged in two rows, nearly orbicular; rudimentary floret stipitate. *Flor. Col., Port. and Coul.*

Heretofore these *Contributions* have embraced only the phanerogamic flora, but it is now proposed to extend them and include the lower plants as well as the higher. It seemed necessary at the start to concentrate attention upon the more easily observed and readily determined classes, in order that the results of the rather desultory herborizing of so few widely separated collectors might have some measure of completeness. No localities are yet exhausted; but several have been so well searched that resident collectors can now profitably turn their chief attention to the lower plants, as some of them have already begun to do. The interests of the phanerogamic flora are not likely to suffer by this expansion; and while waiting for portions of the state less frequented by botanists to be reported upon, and for the detection of obscure species at home, it will be profitable to record the observations on lower plants, both as a matter of record, and as a stimulus to increased activity. The next *Contribution* will accordingly contain a list of the pteridophytes (which include the ferns, horsetails, and club-mosses, although none of the latter have yet been reported from the state), and will be followed in subsequent numbers by a list of mosses, various classes of fungi, etc., as the accumulation of material will warrant. It is hoped the first published list of each class can be made quite full in both the number of species and their distribution. The same rule will be observed regarding the lower plants that has been adhered to for the higher — that every name reported shall be accompanied when possible by a specimen, in order to insure uniform accuracy, and to make it possible to revise the list at any future time by an examination of the plants themselves.

Charles City, Iowa, May, 1882.

ARCTOSTAPHYLOS, Adans.

Notes on the United States Pacific Coast Species, from recent Observation of Living Plants, including a New Species from Lower California.

BY C. C. PARRY.

Presented before the Davenport Academy of Sciences, November 30th, 1883.

Of the twenty-five species of *Arctostaphylos* recognized by the latest authorities (probably to be reduced to twenty or less), fully one-half are comprised within the limits of the United States flora on the Pacific coast.

Since the publication of the Botany of California, which assigns twelve species to that district, one Mexican species, viz., *A. polifolia*, H. B. K., must be withdrawn, and another, *A. arguta*, Zucc., substituted in its place. Besides this, a very well-marked species recently collected near the boundary line in Lower California may properly be added to the list, and is described herewith under the name of *A. oppositifolia*. A geographically tabulated list of our Pacific coast species will accordingly stand as follows, viz.:

- | | |
|--------------------------------------|--------------------------------------|
| 1. ARCTOSTAPHYLOS, UVA-URSI, L. | } High northern in both hemispheres. |
| | |
| 2. <i>A. Nevadensis</i> , Gray. | } Exclusively Californian. |
| 3. <i>A. pumila</i> , Nutt. | |
| 4. <i>A. Hookeri</i> , Don. | |
| 5. <i>A. ANDERSONI</i> , Gray. | |
| 6. <i>A. NUMULARIA</i> , Gray. | |
| 7. <i>A. TOMENTOSA</i> , Dougl. | } Extending into Mexico. |
| 8. <i>A. PUNGENS</i> , H. B. K. | |
| 9. <i>A. GLAUCA</i> , Lindl. | |
| 10. <i>A. BICOLOR</i> , Gray. | |
| 11. <i>A. Clevelandi</i> , Gray. | |
| 12. <i>A. ARGUTA</i> , Zucc. | |
| 13. <i>A. OPPOSITIFOLIA</i> , Parry. | |

In this list I have ventured to characterize as doubtful or imperfectly known such as are *italicized*.

The attempt made at an early day by Nuttall, and later by Klotzsch, to separate *Arctostaphylos* into several distinct genera, founded on different fruit characters, though not generally adopted, has been very properly used in systematic botanical works to divide the genus into natural sections.

Much of the difficulty in properly discriminating species—especially such as, from their extensive geographical range, are subject to extreme variations in their exposure to different conditions of soil and climate—is due to the fact that ordinary collections do not include identical specimens in different stages of flower and fruit, which, as in the present genus, are often separated by a considerable interval of time. The only proper remedy for this will be found in continuous field observations covering the whole period of growth. In the following paper I have endeavored to bring together some of the results of such observations, as far as my recent opportunities have afforded, to complete or rectify our knowledge of Pacific coast species.

The great importance of fruit characters to properly distinguish, not only genera, but species, becomes especially apparent in making a careful examination of any of our imperfectly known plants. Thus, in the genus under consideration, the uniformity of floral characters in everything but size, color, and degree of pubescence, affords absolutely nothing on which to base specific characters; what applies to one will, in great measure, apply to all, within the limit of ordinary variation. The leaves, stems, and inflorescence afford better-marked characters, but cannot be relied on in distinguishing such variable species as *A. pungens*, *A. tomentosa*, and the doubtful ones that have been variously referred to one or the other of these.

In a somewhat extended examination of living plants, and frequent dissection of all the accessible fruit, connected, as far as possible, with flowering specimens from the same bush, I find little difficulty in discriminating species by the fruit alone, except in the following section.

SECTION 2. UVA-URSA, Gray's Synopt. Fl., Vol. 2, p. 27; *Daphnidostaphylis*, Klotzsch.

Here the irregularity in the degree of coalescence of the nutlets and the apparent variability in the number of the cells seem to offer no distinctive characters to be relied on to separate species, so that it is only by combining other distinct features that they can be properly discriminated.

Taking up the species in regular order, we note as follows:

1. *A. Uva-ursa*, L. This is sufficiently well characterized by its peculiar habit and its geographical range. Its smooth, bright red fruit, rather copious granular pulp (in which its nutritive qualities reside), and easily separable cells, only rarely coalescing, apparently justifies the application of the name "*bear berry*," though repeated in three languages.

2. *A. Andersoni*, Gray. Well characterized by its deep green foliage; its oblong, sharply serrate, hastate, or cordate leaves; its viscid, glandular, depressed, deeply umbilicate fruit; drupe with its irregularly coalescent nutlets strongly carinate and deeply pitted in the intervals; mealy pulp rather copious, and closely adherent to the putamen; epicarp dull brick red.

3. *A. tomentosa*, Dougl. (unfortunately named as full oftener smooth than pubescent). As far as my imperfect observations go, this species is best characterized by very irregular, coherent nutlets, not carinate or roughened externally, but easily extracted from the close-grained pulp as a smooth, unequally lobed drupe, generally closely adherent, and when more regular in outline nearly approaching *A. glauca*; cells usually seven, nearly all fertile.

4. *A. pungens*, H. B. K. This exceedingly variable and widely-spread species, best known as the "*Manzanita*" (or little apple), is easily recognized in its typical form as met with in the foot-hills of the Sierra-Nevada. It is here a clumpy bush, branching close to the ground, with smooth, mahogany-colored bark, peeling off in flakes; rather dull evergreen foliage; its conspicuous white clusters of flowers appearing as early as December, in the lower valleys; fruit maturing in July, smooth, brownish-red (or occasionally white before fading), thin epicarp enclosing rather copious granular pulp, sub-acid, and somewhat astringent; nutlets irregularly coalescent, often in pairs, rarely all separate, keeled and roughened externally, of a dark color, with thick putamen, five to seven cells, generally fertile.

In other districts, extending over a wide range of territory, an endless variety of forms are met with, probably including *A. Hookeri*, Don., *A. Nevadensis*, Gray, and *A. pumila*, Nutt. Of these latter, my complete observations apply only to *A. Hookeri*, which was carefully watched during an entire season of growth. The specimens observed were met with in Lone-Mountain Cemetery, near San Francisco, and have been long recognized by California botanists as *A. pumila*. It is here a low, prostrate shrub; leaves oval, reticulate, one-half to one inch

in length; young shoots pubescent, flowers small, fruit undistinguishable from *A. pungens*, and in thrifty specimens not essentially smaller. It agrees well with a flowering specimen from Monterey labelled *A. pumila*, Nutt. So that these two latter may be regarded as the coast forms, while *A. Nevadensis* represents the extreme Alpine form of *A. pungens*.

SECTION 3. XYLOCOCCUS, Gray, l. c.

This brings us, in the natural series, to smooth-berried, solid-fruited species, of which

5. *A. glauca*, Lindl., is the connecting link with the previous section. While very similar, in some of its forms, to *A. pungens*, it is readily distinguished by its glandular-hispid pedicels, its large, more or less viscid fruit, scanty pulp, and smooth, solid putamen, being quite constantly five-celled, one or more abortive. It comprises some of the largest shrubs of this genus, the following measurements being afforded by a specimen on Mt. Diablo, viz.: Lower trunk, 3 feet in height, 5 feet and 1 inch in circumference; height, 25 feet.

6. *A. bicolor*, Gray. This characteristic southern species, which is abundant in the vicinity of San Diego, and extends southward into Lower California, forms a densely branched shrub, three to five feet in height, with brown, shreddy bark; leaves dull green above, whitish tomentose beneath, and strongly revolute, with entire margins; flowers in condensed racemes, white with a pinkish tinge; fruit often persistent until second flowering, in February, smooth and shining, deep purplish-red, four and one-half lines in diameter; copious and rather dense granular pulp; putamen smooth externally, solid, five-celled, one or more abortive.

7. *A. Clevelandi*, Gray. Closely allied to the above, has been collected but once, in imperfect specimens, near the southern boundary line. Though carefully sought at the original locality, it has not been re-collected, and is not unlikely to prove a mountain form of the preceding (*A. bicolor*).

SECTION 4. COMAROSTAPHYLIS, Gray, l. c.

This section, with black, warty fruit and solid, five-celled putamen, will include a Mexican species within the United States territory, lately recognized as *A. arguta*, Zucc. It is probably the same as the one mentioned in "Botany Mexican Boundary Survey," p. 108, as *A. polifolia*, H. B. K., from which it is quite distinct.

My first knowledge of this species was derived from a flowering specimen in the herbarium of D. Cleveland, Esq., of San Diego, which had been collected several years previous, in Jamul Valley, by Mr. O. N. Sanford, by whom I was kindly supplied with additional specimens. Not succeeding in again finding it at the original locality, it remained imperfectly known till re-discovered in 1883, on a trip into Lower California, near Todos-Santos Bay, where I succeeded in securing some belated fruit of the previous season and leaf branches. Subsequently, in April, 1883, my agreeable associate, Mr. C. R. Orcutt, discovered this species growing abundantly in a wooded ravine near the Mission of San Diego, thus making it available for continuous observation. Unfortunately, owing to the dry season of 1883, the bushes failed to produce flowers or show any indications of growth that season, and, accordingly, all the material for clearing up this species was derived from these different sources, on which the following description is based, viz.:

8. *A. arguta*, Zucc., var. *diversifolia*.—Character extended, from living specimens found near San Diego, 1882-3.—Shrub six to fifteen feet high; stems one to three inches in diameter, with light gray bark slightly furrowed, on the upper branches shreddy, and on the young, growing shoots tomentose; leaves varying greatly in size and form, according to position or season of growth; in young, vigorous off-shoots or suckers, broadly lanceolate, three and one-half inches long by one and one-half inches broad, smooth on both sides, reticulate, scarcely at all revolute; on the upper and flowering branches, narrowly lanceolate, strongly revolute, and tomentose beneath, in all more or less irregularly serrate, with mucronate cartilaginous teeth and short petioles. Inflorescence racemose, from the axils of the upper terminal leaves, secund and horizontal, rachis, bracts, pedicels, and calyx long tomentose; bracts about half as long as the pedicels, corolla three lines long, stamens ten (occasionally eight), filaments bearded below, anther appendages about as long as the anthers; style shortly exerted; ovary hairy hispid above. Fruit small, two lines broad, warty, with a solid five-celled putamen, cells more or less abortive. Needs comparison with the Mexican type, which probably includes several published species.

Two more Pacific coast species remain to be noticed, which, on account of their peculiar characters, will require an additional section, viz.:

SECTION 5. MICROCOCCUS.

Fruit with thin pericarp, without mealy pulp, wrinkled at maturity; four or five nutlets easily separating—in two divisions.

*Pericarp fragile, nutlets (usually four) becoming loose and deciduous at maturity; one-celled and fertile.

9. *A. numularia*, Gray. This well-marked Pacific coast species, the fruit of which has been long a *desideratum*, and which, as Dr. Gray anticipated, would, when known, require its removal to a different section of the genus, has at last been brought to light from a specimen kindly supplied by Dr. C. L. Anderson, of Santa Cruz, so that I am now able to complete the account of this species. Character extended. Corolla ovate-globose, shortly urceolate, four-lobed (rarely five), smooth externally, white with pinkish tips, slightly hispid within; calyx usually four-parted, sepals broad oval, hyaline, with finely-ciliate margins; stamens eight or ten, with deep red anthers, filaments smooth, except a few scattering ciliate hairs on the expanded lower portion; style as long as the flower; ovary densely bearded; fruit oblong, two lines long, one line broad, and covered with a thin, fragile pericarp, which at maturity falls off, leaving the four naked nutlets, which soon become separate and deciduous from the persistent calyx; nutlets usually four, barely two lines in length, carinate, and with conspicuous cross-veins; putamen thin, with comparatively large seed.

**Pericarp persistent, nutlets two-celled.

10. *A. oppositifolia*. Shrub three to ten feet high, densely branched above, more or less naked below; stems one to three inches in diameter, with light greenish or gray bark, smooth or with loose, shreddy fibers on the upper branches, young shoots minutely tomentose; leaves *opposite* or ternately whorled, narrowly lanceolate, entire, revolute, one to two inches long, two to three lines wide, light green above, minutely tomentose beneath, with a prominent mid-nerve, the narrow blade gradually tapering to a short or obsolete petiole. Inflorescence paniculate, the lower floral branches in the axils of the upper opposite leaves, which higher up pass gradually into deltoid, more or less acuminate bracts, disposed in whorls of three or less at regular intervals, each bract subtending a branch or pedicel, and decurrent as a ridge down the rachis; pedicels three or four times longer than the bract, bibracteolate close to the base; corolla orbicular, two to two and one-half lines high, shortly urceolate, with broad, reflexed lobes; stamens ten, anthers comparatively large, as long as the appendages, filaments short,

densely bearded at base; style about twice the length of the ovary, included, or slightly exsert; ovary densely tomentose at the summit; fruit orbicular, two to three lines broad, with a smooth, thin pericarp and scanty pulp, becoming wrinkled at maturity, enclosing five easily separable nutlets, nearly equal in size, and *two-celled* by a partition from the ventral suture, occasionally both cells fertile or more or less abortive.

Habitat: Abundant along the edges of ravines in Lower California, within twenty miles of the United States boundary line. First collected in April, 1882, without fruit, and distributed in the collections of Mr. C. G. Pringle as *Arctostaphylos polifolia*, H. B. K.; since collected in fruit at Table Mountain, in February, 1883, by C. R. Orcutt and the writer. A very distinct species, differing from all others of the genus in its opposite or ternately-whorled leaves, suggesting the specific name, *A. oppositifolia*, to replace the manuscript name of *A. salicifolia*, under which it has been distributed. Also noted for its double-celled nutlets.

NEW PLANTS FROM SOUTHERN AND LOWER CALIFORNIA.

BY C. C. PARRY.

Presented before the Davenport Academy of Sciences, December 28th, 1883.

PHACELIA SUFFRUTESCENS.

Among the numerous species of *Phacelia* met with in Southern California, my attention has been frequently directed to one rather common, whose peculiarities seem to have been overlooked, having been referred, in the various collections made in this district, to *Phacelia, ramosissima*, Dougl.

Having lately had occasion to examine the entire group, including this plant, I have come to the conclusion that its very distinct and persistent characters justify its recognition as an undescribed species. Accordingly, from complete material in my hands, I have drawn up the following description, viz. :

Phacelia suffrutescens. Plant decumbent, branching from a perennial root, with occasional suffrutescent stems persistent for several years; hispid pubescent throughout, the setose-hispid hairs intermixed with shorter stalked glands containing an amber-colored, viscid, oily secretion; lower leaves interruptedly pinnate, pinules five to seven, sessile, ovate, pinnatifid-incised or lobed; flowering branches divaricate from the axils of the upper leaves, rather short, with close spikes; flowers shortly pedunculate, sepals spatulate, about twice the length of the capsule; corolla inconspicuous, little exceeding the calyx, short, funnel-form, lobes shorter than the tube; appendages *oblong, obliquely truncate* above, *nearly as long as the tube*, slightly broader, but not auriculate or hooded. below; stamens moderately exerted; style long, divided nearly to the base; ovary short-oval, hispid pubescent, quite constantly one-seeded by abortion; seed dark, oblong, tuberculate in longitudinal lines.

Habitat: Common on rocky ledges throughout Southern California, in favorable and sheltered locations, with persistent, suffrutescent stems one-fourth of an inch in diameter, with shreddy, brown bark and distinct pith; flowering through the early spring months; its copious, oily vesicles leaving a distinct impression of the whole plant on the pressing-paper.

PTELEA APTERA.

In a recent winter trip into Lower California (January, 1883), as far as Todos-Santos Bay, the season, though early, brought to view quite a number of interesting plants. Among these was a new species of *Ptelea*, quite similar in habit and general appearance to the common northern plant *P. angustifolia*, but remarkably distinct in its wingless fruit, requiring, in this respect, a modification of the generic character. An examination of the specimens then collected, being in early flower, and mature fruit of the same, first seen by my associate, C. R. Orcutt, afford the means for the following detailed description, viz. :

Ptelea aptera. A densely-branched shrub, forming clumps five to fifteen feet high, with stems one to two inches in diameter; young, growing shoots, with reddish-brown bark, thickly beset with pustular glands; leaves trifoliate, leaflets one-half to three-quarters of an inch long, ovate to sub-rhombic, obscurely crenate, densely pubescent when young, with distinct marginal veins, and pellucid punctate with larger and smaller glands; inflorescence terminal in scant corymbs, or in depauperate specimens single-flowered; flowers apparently all perfect in four or five divisions, calyx short; pedicels, sepals, and outer surface of corolla pubescent; stamens one-third shorter than the petals, filaments smooth, widening towards the base, disc of ovary conspicuous, stigmas sessile; fruit broadly ovate, lenticular, wingless, more or less carinate, three to six lines long, three to four lines broad, bluntly emarginate at base, and tipped with the persistent stigmas, two-celled, or occasionally three—in the latter case bluntly triangular—externally covered with pustular glands, seeds oblong, corrugated, black when mature, occasionally both ovules developed in one of the cells; unfertilized flowers deciduous, as a whole.

Habitat : Dry hill slopes near the sea at Punta-Banda, southern end of Todos-Santos Bay. In early flower January 24th, at which time it was collected by C. R. Orcutt, W. G. Wright, and the writer. The pungent aroma is very agreeable and persistent. The only change required in the generic character to admit this species would be to add to the description after, "broadly-winged," or *wingless*, which is suggested by the specific name adopted, viz., *P. aptera*.

POLYGALA FISHLÆ.

Shrub three to five feet high, with slender, dependent stems, leaves oblong-ovate, smooth, entire, obtuse, shortly petiolate, irregularly scat-

tered along the branches; inflorescence terminal in scant racemes; flowers pedicellate, the lower subtended by reduced leaves, upper short bracteate, outer sepals pubescent, ciliate on the margins, dull reddish, lateral ones broad oval, smooth, and petaloid; lateral petals broad oval, pubescent internally, as long as the broad, central hood, with a short, curved beak; stamens eight, as long as the curved style, capsule (immature) orbicular, narrowly margined; seed, hairy pubescent.

Habitat: In the vicinity of Sauzal, on Todos-Santos Bay, Lower California. Discovered by Miss Fanny E. Fish, to whom we are indebted for several interesting plants of that district, and to whom this interesting addition to the Pacific coast flora is appropriately dedicated.

GILIA ORCUTTII.

Mr. C. R. Orcutt, of San Diego, whose name has been mentioned above in connection with several botanical discoveries, and who has lately published a list of the plants recently collected by him in the vicinity of San Diego, has furnished specimens of a new *Gilia* from Lower California, for which, as an appreciation of the intelligent zeal of the discoverer, I proposed the name of *Gilia Orcuttii*. Submitted to Prof. Asa Gray, he has kindly furnished for publication the following diagnosis, viz.:

Gilia (Leptosiphon) Orcuttii. A span high, slender; leaves only two or three pairs up to the inflorescence, very small, with filiform divisions; flowers few, in the clusters; tube of the corolla less than half-inch long, rather thick, dilated at summit, hardly longer than the turbinate campanulate throat and limb, its lobes ovate; stamens and style included.

Habitat: High mountain ridge in Lower California. Collected by C. R. Orcutt, June, 1883. Color of flowers light blue, with deep purple spots; resembles *G. densiflora* in the shortness and comparative thickness of the tube, otherwise unlike, and to be placed between that and *G. brevicula*, to which it is nearest allied, but abundantly distinct.

THE CHAMBERS LIGHTNING-ROD.

Note on an Article in Volume III. of the Proceedings of the Davenport Academy of Sciences.

BY E. W. CLAYPOLE.

Presented before the Davenport Academy of Sciences, October 26th, 1883.

In the second part of the third volume of the proceedings of the Davenport Academy, is a short paper by W. H. Pratt, entitled "The Chambers Rod and the Phoenix Mill Fire." In that paper it seems to me that Prof. Pratt has satisfactorily proved that the fire in the mill was caused by lightning. The fact that the mill was clean, and had not been running for some weeks, is sufficient to meet the allegation that the fire may have been caused by spontaneous combustion, aided by explosive dust. It might have been added, that there was no explosion. Moreover, one man bore distinct testimony to having *seen* the lightning strike the mill.

The mill, it appears, was fitted with the "Chambers" rod, the peculiarity of which is that it has no ground connection, and professes to dissipate the electric charge without conveying it to the earth. Much discussion has been aroused in regard to the protective power of this mode of constructing and setting up lightning-rods. Experience, which should be the final court of appeal, is not, in this case, so conclusive as it might be. Lightning-rods of all kinds are so carelessly put up, and, what is more, so carelessly kept up, that accidents from lightning are not infrequent even to "protected" buildings. That well-made and well-kept lightning-rods are, however, not only efficacious, but thoroughly effective, in preventing damage, is proved by the fact that no loss has been sustained by the British navy from this cause since the adoption of Sir W. Snow Harris's lightning conductors. It should be borne in mind that a rod does not avert the electric discharge, but only the danger and damage that would be caused by an electric explosion. Ships of the British navy are probably struck as often now as formerly, but no explosion ensues, and no mischief is done. Yet, in spite of all the "protection" afforded by lightning-rods in this country, in some

parts of which every other house and barn is fitted with them, I cannot learn that the fire insurance companies make much or any diminution in their rates of premium on buildings so fitted. These remarks apply to all kinds of lightning-rods. Whatever their construction, unless well made and well kept, they are a source of danger, rather than of safety.

But there is an element of danger in the Chambers rod, arising from the principle on which it is constructed, that does not exist in the case of the usual "earth-fast" rods. These latter act on the principle that the air and the earth are always in opposite states of electric tension. Our knowledge does not allow us to say if this is absolutely and necessarily true, but experience shows that it is perfectly safe in practice to assume that it is so. Consequently, the action of the rod depends on its power of communicating by a continuous and infusible conductor between the one and the other, by which means the electric tension is equalized, either by a slow and silent discharge, as commonly occurs, or by a sudden and sharp flash.

The Chambers rod, on the other hand, is constructed on the principle that different masses of air are also in different conditions of electric tension, and that these different masses of air are very near each other. The first of these two principles is true beyond question. This is proved by the constant passage of sparks or flashes of lightning between cloud and cloud, or, more accurately speaking, between one body of air and another, without "striking" the earth at all. Probably this is by far the commonest mode of restoring the disturbed equilibrium. Not one flash, apparently, among hundreds that occur, strikes the earth, or anything upon it. Were it otherwise, so many storms could not happen without any mischievous consequences. Comparatively seldom do we hear that anything or anybody has been struck by one of the hundreds of electric flashes occurring during every summer. They discharge themselves in the air. An overcharged mass relieves itself by "flashing" into one with less tension at no great distance. So far, the principles on which the Chambers rod is constructed are well founded.

But the second principle is open to grave suspicion, and this suspicion, to say the least, is a serious objection to the general adoption of this system of "protection." In assuming that these masses of air of unequal electric tension are in close proximity, the advocates of this system claim more than can be granted. Without raising any question of the meaning of the word "proximity," it is evident that it must mean "striking distance." Now, that two masses of air of une-

qual tension are usually within striking distance is amply proved by the fact above mentioned—that almost all the electric discharges occur between cloud and cloud. But that this is not always true is proved with equal certainty by the other fact that sometimes the discharge takes place between the cloud and the earth. Against the former we need no protection, because discharges between masses of air of unequal tension are harmless to the earth and things on it. It is the latter kind of discharge solely against which lightning-rods are intended to afford protection. The assumption, therefore, that a mass of air overcharged is always near enough to one that is undercharged to flash into it being baseless, renders any mode of protection founded upon it to a great extent untrustworthy. I say to a great extent, because a mass of overcharged air, though naturally out of reach of a mass of undercharged air, may be brought within reach of the same by artificial means—and this is what is attempted by the Chambers lightning-rod. A cloud or over-excited mass of air at one place may be out of striking distance of a mass of under-excited air, but if a long copper rod be laid from one to the other, or from near the one to near the other, the spark may pass. Consequently, if a large or long building be fitted with the Chambers rod, with no earth connection, it is more than probable that some of the most distant points will be beyond the influence of a thunder-cloud that is able to discharge into a nearer one, and may, consequently, take the charge and pass it off into the less electrically tense air that overhangs them. In this way, a building so protected may be struck and not injured. It is, however, obvious that this protective power must rapidly diminish with the size, and especially with the length, of the structure; and when this is reduced to small dimensions, it is more than possible that all the points are within striking distance of the same cloud. Consequently, there is then no discharge, and the danger to the building is vastly increased by the presence of the rod.

Now, the Phoenix Mill was a structure of this kind. It measured only fifty by thirty feet, and all its points were probably within the influence of the mass of excited air from which the flash proceeded. Not having any path provided for its escape, it took the conductor and then the building in its passage to the earth. It is needless to add that, on this view, an ordinary conductor, with good earth-plate, would have efficiently protected the building.

It may be replied that the conductor was insulated from the roof; but the reply would be futile. It matters little or nothing whether this

conductor, or any other, be insulated or not. A flash that can leap from the cloud to the rod can certainly leap from the rod to the roof.

The necessary inferences from the views above put forward are :

1. That the Chambers rod possesses no virtue which ordinary rods do not possess, except a slightly lower cost.
2. That the Chambers rod can, and doubtless does, in many cases, protect buildings when they are extensive and the points at considerable distances from each other.
3. That the Chambers rod loses its virtue when applied to small buildings.
4. That the Chambers rod has least protective power when the danger is greatest—that is, when the mass of charged air is very large.
5. That while these objections diminish the protective power of the Chambers rod, a rod with good earth connection of sufficient size, and in perfect order, with a sufficient number of points, affords protection, if not absolute, yet so nearly absolute that the danger from lightning to a building thus protected is infinitesimally small.

CHORIZANTHE, R. Brown.

Revision of the Genus, and Rearrangement of the Annual Species—
with one Exception, all North American.

BY C. C. PARRY.

Presented before the Davenport Academy of Sciences, January 25th, 1884.

TO THE MEMORY

Of my honored friend and instructor,

DR. GEORGE ENGELMANN,

Of St. Louis, Mo.,

Whose botanical investigations, extending over half a century, have been everywhere recognized as a worthy model of scientific accuracy and thoroughness; whose life has been adorned by a noble manliness of character, and a most generous sympathy with all associated with him in botanical pursuits; this paper, written under his friendly advice, and completed within a few days of his decease (February 4th, 1884,) is mournfully dedicated.

PRELIMINARY OBSERVATIONS.

Since the elaboration of the genus *Chorizanthe* by Torrey and Gray, in Proc. Am. Acad., Vol. VIII., pp. 192-99, and the more recent publication, by Mr. Sereno Watson, in the Botany of California, Vol. II., including twenty-seven species, there would seem to be little left for less competent gleaners in this limited botanical field. An unexpectedly prolonged stay on the Pacific coast, including the years 1880-83, with unusual traveling facilities granted by the railroad officials, as well as the aid afforded by obliging correspondents, has accumulated in the hands of the writer a large amount of material especially rich in this almost exclusively Californian genus. In endeavoring to put this material into systematic order, I found that preceding writers (owing to the scantiness of material, or the distraction of other absorbing studies) had apparently overlooked some important characters, that seemed essential for the proper arrangement of this recently enlarged genus into natural groups and sections. In following out the idea thus suggested, the writer was induced to occupy

a period of leisure from field observations in a careful study of all the available material at his command relating to this particular genus, and the condensed results of the same are herewith presented. In realizing (perhaps for the first time) the care and labor involved in such an investigation, it has served at least to heighten the respect and reverence due to those masters of botanical science who have taken upon their broad shoulders the burden of a systematic arrangement of the whole vegetable kingdom.

GENERAL OBSERVATIONS.

In common with other closely allied genera of *Eriogonæ*, the genus *Chorizanthe* is readily distinguished in its usual low-branched or decumbent habit, its clustered radical leaves (which soon disappear with the dry season), from the crown or axils of which spring jointed stems, which are dichotomously branched above, forming a more or less spreading summit. In the axils of each joint, subtended by cauline leaves, or more usually reduced to awn-tipped or trifid bracts, there is a closely sessile involucre, the lowest of which, being the first developed, is not unfrequently different in texture and form from the upper ones, which continue the determinate centrifugal inflorescence. By the side of these lower developed involucre spring the branches, single or in pairs, that make up the continued growth. In nearly all cases each involucre is subtended by a pair of opposite or single bracts, which are usually less conspicuous where the involucre are cymosely clustered. In a few cases (*C. Spinosa*), a cluster of less developed and deciduous involucre occupies the larger axils, being quite different in size and appearance from the single central one. With considerable difference in shape and texture, there is still quite a uniformity in the general character of the involucre, all being closely sessile, more or less sharply ribbed, and cleft into three to six divisions terminated by awns, usually recurved and uncinat, or more rarely slightly divergent, and straight. The first in the series, being taken for the type (*C. Thurberi*), is strongly suggestive of *Oxytheca*, the genus immediately preceding it. It agrees closely in its general habit of growth, its chartaceous involucre, with teeth terminating in straight awns, and its pedicellate flowers, usually two. The singular saccate spurs at the base of the involucre cannot be regarded as of any special significance, being simply a contrivance for facilitating its dispersion, which is much more effectually carried out in the succeeding species (*C. leptoceras*) with an increased number of spurs, strongly divaricate, and sharply hooked at

the extremity. In succeeding allied species this special character gives place to a simple protuberance at the base of the involucre (*C. membranacea*). In sustaining the view adopted by Mr. Watson of including *Centrostegia*, Gray, in *Chorizanthé*, making it a section merely, it was satisfactory to find that an undoubted *Chorizanthé* species, viz., *C. Spinosa*, Watson, has quite constantly more than one flower, sometimes two fully developed, but generally the secondary more or less imperfect. It was a still greater surprise that a suspicion floating in my mind, that *C. membranacea* should come into closer relations to section *Centrostegia*, was confirmed by discovering, on close examination, evident traces of a second undeveloped flower, thus bringing this otherwise anomalous species clearly into this section.

The gradation to single flowers, in the *Acanthogonum* section, combined with other characters, satisfactorily rounds out what I have designated as group A. CAMPYLOSPERMA, including all the species with inflexed radicle, and orbicular accumbent cotyledons.

In passing to the second main division of group B. ORTHOSPERMA, with oval or linear cotyledons and straight radicle, there is a very natural transition afforded through the section *Chorizanthella* and *Mucronea* to *Euchorizanthé*. This will be apparent to any one who will place the species in the order indicated in the following synoptical arrangement, which carries the species down by regular steps to the most simple or reduced form.

It was mainly from a consideration of the uniformity and persistence of the involucre characters that I was induced carefully to examine the anomalous genus *Lastarriea*, Remy. This is described by authors as without an involucre, assuming that what clearly takes the position and has all the external characters of an involucre to be a proper perianth. Now, as the obvious use of the involucre in this natural order of plants is the protection of the essential reproductive organs, when the object, as in this case, is fully accomplished, the less essential internal covering, represented by the perianth, can be most safely dispensed with. Therefore, recognizing in *Lastarriea* such an external envelope, corresponding in every way to what in all the allied species of *Chorizanthé* is regarded as an involucre, in failing to find the ordinary perianth within, the reasonable supposition is that, being needless, it has become obsolete. Or, if a different view should be preferred, leading to the same result, the perianth, instead of being merely sessile, has become adnate to the tube of the involucre. To confirm either of these views, the insertion of the reduced stamens is plainly indicated

on an obscure, thickened ring at the throat of the involucre, with small intervening lobes, barely distinguishable under a lens, but plainly indicating an obsolete perianth. In this view of the case, the whole question is at once cleared up; an anomalous monotypic genus is merged into its nearest allied genus, and *Lastarriæa Chilense*, Remy, becomes *Chorizanthe Lastarriæa*, appropriately closing up the genus with its most reduced species, and naturally connecting it with succeeding genera of a still more reduced type.

GEOGRAPHICAL DISTRIBUTION.

The peculiar geographical distribution of the genus *Chorizanthe* is deserving of special consideration. Thus, while agreeing in its general habit with the closely allied and extensive genus *Eriogonum* (and with fully one-fourth as many species), it has a much more limited range, being mainly confined to the arid coast and desert regions of California. Out of the twenty-eight species here recognized, only three extend as far east as Southern Utah, and the state of California includes within its present boundaries all the known North American species. The exceptional case of *C. Lastarriæa*, also occurring in similar districts on the South American Pacific coast, without any known intermediate locality, can hardly be accounted for on any general law of vegetable distribution, and would seem to favor the view of accidental transportation by human agency; but its wide prevalence throughout all Southern California, and the still more remarkable analogous case of *Oxythecca dendroidea*, having a similar disconnected range, and without any special provision for effecting accidental transportation, is opposed to such a supposition. But, leaving out of view these anomalous cases, it is more to the present purpose to enquire what are the conditions of soil and climate in which this particular genus finds a congenial location; or, in accordance with the prevailing philosophic views, what is the natural environment that determines their peculiarities and rigidly defines their geographical limitation?

Now, the main feature of the California coast climate, as well as the adjoining desert districts to the east, where this genus is more or less prevalent, is a winter rainy season, not too cold to check ordinary growth, succeeded by a dry, warm season, favoring only a limited development of plants adapted to arid conditions. Hence, all annual plants (including *Chorizanthe*) require to have their vigorous growth fully established during the season of moisture, and their subsequent development, if prolonged into the dry season, is maintained by

drawing on the nourishing material previously stored up. Accordingly, with the early winter rains we find the various species of *Chorizanthe* promptly germinating, and soon spreading their clustered radical leaves in the warm winter sunlight. There is thus accumulated in the thickened axis of growth (closely resembling a reduced biennial) the necessary stores for future use. As showing, in a remarkable manner, the sensitiveness of mature germs in this genus to the stimulus of moisture, it not unfrequently happened that in subjecting specimens to soaking for subsequent dissection, when left over night in tepid water, on the following morning radicles were found protruding half an inch or more. As the dry, warm season advances, the radical leaves, having performed their functions, gradually wither and disappear, and the flowering stems, usually copiously branched, shoot up, commencing at once in the lowest axils the development of flower and fruit, to be continued upward in a dichotomous centrifugal inflorescence as long as the season of growth allows, or the stores of nourishment hold out. It thus happens that according to the season or location a vigorous or depauperate growth is produced, but never, even in the most reduced specimens, is there an entire failure of flower and fruit. This explains most satisfactorily why this class of plants is naturally confined to a limited geographical range, as well as their more obvious morphological peculiarities. What are the special conditions which in corresponding South American districts determine a prevalence of perennial suffruticose species in this genus, though an interesting question, lies outside of the line of present investigation.

The special contrivances for dissemination, so frequently noticed in this genus in the sharply-hooked awns attached to the seed containing involucre, and the commonly fragile joints at maturity, is one of the important factors that materially assists in the maintenance and extension of such species, thus enabling them to avail themselves of any accidental means of transportation.

In the succeeding synopsis and reërrangement of species, in accordance with the preceding views, in order to give completeness to the subject, I have added detailed descriptions of each species in a uniform order, so that the resemblance and contrast of each can be most readily seen, whether in the field or the study. For fuller details and synonyms, reference may be had to the authorities herein referred to.

CHORIZANTHE, R. Br.

Involucres tubular or infundibuliform, sessile, 2-6 angled or costate, and 2-6 toothed or cleft, the divisions more or less divaricate, and terminating in cusps or rigid awns, frequently uncinat. Flowers 1-3, pedicellate or nearly sessile, without bracteoles, included in the involucre, or more or less exsert, *rarely obsolete*; perianth 6 parted or cleft; stamens 9, rarely 3-6, inserted on the base, or more or less adnate to the tube, rarely on the throat of the perianth. Styles linear, stigmas capitate. Ovary glabrous; akene broadly or narrowly triangular, beaked. Embryo with inflexed or straight radicle.

Dichotomously branched plants, with rosulate radical leaves and jointed stems, cauline bracts opposite or unilateral, trifid or simple, rarely verticillate, usually awn-pointed. — Benth. & Hook., Gen. Pl., III., p. 93. Watson, Bot. Cal., II. *Lastarria*, Remy.

Synoptical Arrangement of Species.

(Excluding South American Perennials.)

GROUP A. CAMPYLOSPERMA.

Cotyledons orbicular, accumbent to the inflexed radicle.

§1. CENTROSTEGIA. Involucres 2-3 flowered, flowers pedicellate, the secondary or tertiary flowers often imperfectly developed. Stamens 9, inserted on the base of the perianth.

* Involucres unequally 5-6 cleft or parted, saccate near the base of the tube with 3-6 divaricate spurs, straight awned or uncinat; usually 2 developed flowers; involucre bracts unilateral, trifid and cuspidate. *Centrostegia* Torr. & Gray.

1. C. THURBERI, Watson, l. c. Erect, smooth or glandular-pubescent, with slender dichotomous branches above the short (1-4 inches) caudex; radical leaves oblong-spathulate, sessile, smooth, with ciliate hairs on the margins; cauline bracts short, trifid, acuminate; involucre scattered, single, chartaceous, reticulated; teeth 5, short, triangular, slightly unequal, cuspidate; tube protuberant below into 3 (rarely 4) saccate, divaricate, cuspidate spurs; flowers usually 2 (with occasional traces of a third, undeveloped), unequally pedicelled, the longer exsert; perianth deeply parted, slightly unequal, hispid hairy externally; stamens 9; styles as long as the ovary; akene triangular, beaked; embryo with slender inflexed radicle.

Habitat: Eastern desert districts of the Mojave, and Colorado valley, to Southern Utah. Figured in Pacific R. R. Rep., Vol. IV., pl. 8.

2. *C. LEPTOCERAS*, Watson, l. c. Procumbent, branching from the base, $\frac{1}{2}$ –6 inches broad, smooth or glandular near the joints; radical leaves narrowly spatulate, smooth, becoming revolute; cauline and involucre bracts trifid, obtuse and ciliate below, acuminate-cuspidate above; involucre scattered in the lower axils, cymosely clustered on the upper and terminal branches, divisions 6, very unequal, narrowly linear, with prominent mid-rib, and ciliate margins terminating in slender, straight awns, tube short-turbinate, the 6 spurs corresponding to the divisions divaricately spreading, curved and sharply uncinat; flowers 2–3, unequally pedicellate, and exsert, villous-pubescent externally, segments oblong, nearly equal; stamens 9, anthers red; styles slender; akene triangular, beaked; cotyledons small, inflexed radicle slender.

Habitat: Dry, gravelly plains near San Bernardino, May.

* * Involucre equally 6 cleft, with conspicuous scarious margins, and reflexed uncinat awns; tube protuberant-saccate (not spurred) at base; secondary flowers undeveloped and inconspicuous; involucre bracts narrowly foliaceous, whorled or opposite, shortly acuminate.

3. *C. MEMBRANACEA*, Benth., Watson, l. c. Erect, 6–18 inches high, lanosely-pubescent when young, deciduous with age, sparingly branched above, radical and lower cauline leaves linear, obtuse, or shortly acuminate above, forming irregular whorls at the lower axils; involucre in the lower axils few, without scarious margins, the upper in condensed capitat heads, with equal, broadly expanded scarious winged divisions, reflexed, rotate and tipped with a slender uncinat awn; tube ribbed and protuberant below; flowers 2–3, one with long pedicel partly exsert, the others undeveloped, nearly obsolete; perianth short-tubular, campanulate, hairy externally, segments oblong equal; stamens 9 at the base, styles rather short; ovary at maturity covered with remains of the perianth, and nearly filling the contracted rigid tube of the involucre; akene broadly triangular, beaked; cotyledons thick, yellow, with short inflexed radicle.

Habitat: Rather abundantly distributed on rocky foot-hills of the Sierra-Nevada. Clearly belonging to the *Centrostegia* section in its saccate protuberant involucre tube and its long pedicellate flowers, including the undeveloped ones, which have been heretofore overlooked.

* * * Involucre unequally 4–5 cleft, one division much the longest, all with straight rigid awns, tube short, costate (not saccate), varying in size, flowers 2–3, with short jointed pedicels, unequally developed; cauline and involucre bracts ternate, or opposite, slender and rigidly awned.

4. *C. SPINOSA*, Watson, l. c. Erect or decumbent, 2-4 inches broad, hairy-pubescent, branching from the base; radical leaves oval obtuse, villous-pubescent beneath, with scattered appressed hairs above, petioles about as long as the blade, margined and revolute when old, expanding at base to a broad, clasping insertion; cauline bracts ternate, or opposite, connate, narrow, reflexed, and rigidly awned; involucre pubescent, divisions very unequal, of one long rigid awn, two others about half the size, and one or two smaller, intermediate, all straight, the central axillary involucre much the largest, closely adherent, with smaller ones crowded, in irregular clusters, frequently infertile and deciduous; flowers 2-3, unequally developed, the more perfect longer pedicelled, and more or less exsert, the smaller usually imperfect, perianth tubular, outer segments spathulate-orbicular to obcordate, with a short claw, the inner one half shorter and ovate; stamens 9, anthers oblong, styles long and slender, akene broadly triangular, beaked; embryo with yellowish green cotyledons, and long radicle.

Habitat: Mojave Desert, J. G. Lemmon, 1880; C. C. Parry, 1881; Parish Brothers, 1882. Softly pubescent when young, becoming rigid spinescent when old, connecting the previous species of this section with the more ordinary forms of *Euchorizanthæ*.

§ 2. *ACANTHOGONUM*, Torr. & Gray. Involucres 1 flowered, broadly triangular-turbinate, sharply costate, and reticulate on the sides; divisions 3-5, the three principal ones unequal, divergent, terminating in rigid straight or uncinatè awns; involucre bracts foliaceous, cuspidate or rigidly linear-spinescent; flowers short pedicelled; stamens 6-9, with short filaments, inserted on the throat.

5. *C. POLYGONOIDES*, Torr. & Gray, Watson, l. c. Procumbent, 4-10 inches broad, branching from the base, smooth or sparingly pubescent, stems short, jointed, and fragile; radical leaves narrowly spathulate, obtuse, gradually tapering into a slender petiole widened at the base, cauline and involucre bracts opposite and connate, less foliaceous and more acuminate above; involucre coriaceous and reticulated, sparingly clustered in the axils, more or less hairy pubescent, broadly triangular-turbinate, sharply 3-costate, with broadly divergent divisions, terminating in uncinatè awns, 2 intermediate, smaller; flowers single, pedicellate, shortly exsert, tube narrow and slightly contracted at the throat, segments equal, obtuse or truncate, ciliate-hairy externally; stamens 6, with short filaments, inserted on the throat, anthers broad-oval, bright red, soon deciduous; styles short, erect; akene broadly triangular,

beaked; embryo in rather copious albumen, cotyledons yellowish-green, with long radicle.

Habitat: First discovered by V. Rattan, Placerville; lately rediscovered, 1883, by Mrs. R. M. Austin and C. C. Parry, on volcanic rocks at Chico; also, by Mrs. K. Curran, at Folsom. In its low, prostrate habit, with frequent reddish stems, it is more suggestive of *Euphorbia* than *Polygonum*.

6. *C. RIGIDA*, Torr. & Gray, Watson, l. c. Erect, 2-4 inches high, villous-pubescent, shortly branched above, forming dense spinose heads; radical leaves orbicular-ovate, long petioled, upper cauline leaves usually larger, with broad-ovate orbicular lamina abruptly contracted into a long petiole, white villous-pubescent beneath, appressed pubescent above; branches in the axils of the upper leaves usually densely crowded, or occasionally prolonged; upper involucral bracts in cymose clusters, spinescent, becoming rigid, exceeding the involucre; involucre variable in size, villous-hairy externally, broadly triangular, tube short, obconic (1 line long), divisions 3, one longer $2\frac{1}{2}$ lines long, 1 line broad, two smaller $1\frac{1}{2}$ lines long, all sharply costate, the ribs prolonged into stout awns, and with conspicuous marginal nerves and few cross-veins; flowers single, pedicellate, jointed at the base of the perianth, tube slender, obconic; segments equal, ovate-acuminate villous externally; stamens 9, inserted on the throat, with short filaments, and broad oval anthers; styles short, recurved; akene broadly triangular, beaked; embryo with rather thick yellowish cotyledons, and blunt radicle.

Habitat: Gravelly table-land of the Colorado valley, extending eastward into Southern Utah; in its winter vestiges showing only dense heads of the persistent rigid spinose bracts.

GROUP B. ORTHOSPERMA.

Cotyledons ovate or linear, with straight radicle.

§ 3. *CHORIZANTHELLA*. Involucres 1 flowered, 3-5 cleft, the larger divisions foliaceous, with prominent mid-ribs and marginal nerves, the smaller narrow, all with rigid recurved tips, and uncinatc awns, tube narrowly cylindric, tapering to the base, conspicuously or obscurely corrugated, or smooth and ribbed; flowers pedicellate, included or slightly exsert; stamens 6-9, inserted on the tube, near the middle, or on the throat.

7. *C. CORRUGATA*, Torr. & Gray, Watson, l. c. Erect, 1-3 inches high, floccose-tomentose below, smoother above, densely branched near

the base; radical leaves orbicular to ovate, $\frac{1}{4}$ to $\frac{3}{4}$ of an inch long, more or less abruptly passing into slender petioles $\frac{1}{2}$ to 1 inch long, tomentose-wooly on both sides; upper cauline bracts opposite, connate, setaceous recurved and uncinat; involucre single in the forks, somewhat crowded along the short jointed intricate branches, tube narrowly obconic, smooth, inconspicuously costate, and strongly corrugated; divisions 3, more or less unequal, with prominent mid-rib and marginal nerves, with few cross-veinlets, tomentose internally above the throat, divergent, recurved and uncinat awned, a little longer than the tube, flowers included, pedicellate, perianth cleft one-third; segments equal, narrowly spatulate, with a small ciliate tuft near the summit; stamens 6, filaments unequal, inserted on the tube, anthers small orbicular; akene oblong triangular; embryo with linear cotyledons, longer than the slender radicle.

Habitat: Dry, gravelly washes on the Colorado desert, March and April.

8. *C. WATSONI*, Torr. & Gray, Watson, Bot. King Exp., t. 34. Shortly erect or decumbent, 2-4 inches high, appressed-pubescent, branching at the base; radical leaves narrowly oblanceolate, tomentose beneath, becoming revolute, lower cauline leaves similar but smaller, and uncinately awned, passing above into opposite recurved uncinat bracts; involucre cymosely clustered on the upper and terminal branches, tube narrow, inconspicuously costate and corrugated, divisions 5, unequal, one larger, three or four times exceeding the others, all shortly uncinat; flowers pedicellate, partly exsert, yellowish; perianth segments oblong, acute, pubescent externally; stamens 9, on the throat, with short filaments, and small oval anthers; styles short, recurved; akene oblong-triangular; embryo with linear cotyledons, as long as the radicle.

Habitat: Desert districts of Nevada, and the Mojave.

9. *C. ORCUTTIANA*, n. sp. Decumbent, 2-6 inches broad, appressed-pubescent throughout, densely branched from the base; radical leaves narrowly lanceolate, obtuse, tapering to a slender petiole; cauline leaves smaller, sessile, opposite, connate, obtuse; upper involucre bracts broadly triangular, scarious, acuminate; involucre in the lower forks and loosely scattered on the slender branches, sharply triangular, with short chartaceous tube (not corrugated); divisions 3, nearly equal, not conspicuously foliaceous, broadly divergent, with recurved uncinat awns; flowers partly exsert, pedicellate; perianth as long as the pedicel, tube narrowly turbinate, segments equal, narrowly spatulate, with

long ciliate hairs externally, extending beyond the segments in an irregular fringe; stamens 9 (or less), with short filaments on the throat; anthers dull reddish, orbicular; stigmas short, recurved; akene narrowly triangular; embryo 1 line in length, with linear cotyledons and slender radicle.

Habitat: Exposed sandy soil on Pt. Loma, San Diego, March, 1884. Specimens received while this paper was in press, and appropriately dedicated to its enterprising discoverer, C. R. Orcutt. A most interesting addition to this section, and the only representative thus far met with directly on the coast. Increases the number of species from 28 (see page 48) to 29.

§ 4. *MUCRONEA*, Torr. & Gray. Involucres 1 flowered, with 2-4 rigid, divergent, acuminate divisions, tube oblong, somewhat contracted at the throat, horizontally flattened or sharply angled and sulcate; flowers long, pedicellate, exsert; segments of perianth entire or lacinate; stamens 9, at the base; involucre bracts unilateral, broadly foliaceous, trifid, cuspidate, more or less perfoliate.

10. *C. PERFOLIATA*, Gray, Watson, l. c. Decumbent, branching from the base, 6-12 inches broad, smooth or more or less glandular pubescent; radical leaves, broad, spatulate, sessile, smooth, with short ciliate margins; cauline and involucre bracts broadly triangular-trifid, more or less perfoliate, abruptly acuminate, similar but smaller above; secondary branches rather scattered, usually simple prolonged; involucre coriaceous rigid, 2 lines or less in length, slightly curved, quadrangular and sharply costate, divisions 4, slightly unequal, divergent, and terminating in straight rigid awns; flowers pedicellate, exsert, deeply parted; perianth segments equal, conspicuously nerved, abruptly notched at the summit, and irregularly lacinate on the edges; stamens 9, at the base, anthers oval, deep red; styles slender, recurved; akene triangular; embryo with oval cotyledons, as long as the radicle.

Habitat: Mojave desert, and rocky slopes of Tehachapi Pass, May. Whole plant reddish-purple at maturity.

11. *C. CALIFORNICA*, Gray. *Mucronea Californica*, Benth., Linn. Trans., XVII., t. 20. Erect, 4-8 inches high, hispid-pubescent, dichotomously branching from a short caudex; radical leaves narrowly spatulate, more or less hairy pubescent; cauline bracts unilateral, broadly trifid, acuminate; involucre more or less clustered in the axils, tube flattened, smooth or obscurely glandular, divisions 2, broadly

divergent, rigidly straight awned, the upper internal face hispid-hairy, occasionally one or two smaller intermediate; flowers pedicellate, partly exsert; perianth deeply parted, segments obovate entire, the outer with a ciliate tuft at the tip; stamens 9; styles slender, recurved; cotyledons oval, as long as the radicle.

Habitat: Dry, gravelly plains near San Bernardino to San Diego, May. Less conspicuously red than the preceding.

§ 5. *EUCHORIZANTHE*, Torr. & Gray (exclude *C. membranacea*). Involucres cylindric, divisions 5–6, more or less unequal, divergent, and terminating in recurved awns, usually uncinat, rarely straight, with margins occasionally scarious winged or naked; tube angular and sulcate; flowers short pedicellate or nearly sessile; perianth more or less exsert, rarely included, in a single case (*C. Lastarriae*) obsolete; segments usually unequal, variously lobed, truncate, erose or lacinate; stamens 9, occasionally 3–6, inserted on the base, or more or less adnate to the tube, rarely on the throat; styles usually long linear, with capitate stigmas; akene oblong triangular, narrowly winged.

* Erect, dichotomously branched toward the summit, with irregular whorled foliaceous bracts in the lower axils; cymes more or less condensed at the upper internodes, or on the naked terminal branches.

+ Involucral divisions with scarious margins; perianth segments nearly equal.

12. *C. STELLULATA*, Benth., Watson, l. c. Slender, 3–6 inches high, hairy-pubescent, somewhat umbellately branched from a short caudex, corymbosely crowded above; radical leaves short lanceolate, sessile more or less pubescent and ciliate, an intermediate whorl of foliaceous bracts on the lower stem and at the axils of the main branches; upper cauline bracts acicular and ciliate; involucres single in the lower axils, cymosely clustered above, tube cylindric, sharply costate, smooth or ciliate on the ribs; divisions 6, nearly equal, with conspicuous scarious margins (except in the lower axils), and short recurved uncinat awns; flowers short pedicellate, narrowly tubular; perianth segments partly exsert, nearly equal, obcordately lobed and folded; stamens 9, adnate near the base; styles slender, recurved; akene narrowly triangular; embryo with green linear cotyledons and short radicle.

Habitat: Abundant on volcanic rocks near Chico, May.

13. *C. DOUGLASH*, Benth., Watson, l. c. Stout, 2–18 inches high, light green, densely pubescent, simple, or irregularly branching above, with one or more foliaceous whorls on the main stem and lower axils; radical leaves oblanceolate, tapering to a narrow petiole; upper invo-

lucral bracts acicular, densely ciliate; involucre oblong-triangular, 2-3 lines long; divisions unequal, slightly divergent, with scarious margins, and short recurved uncinat awns; flowers shortly pedicellate, perianth partly exsert; segments nearly equal, shortly mucronate, and erosely denticulate at the tip; stamens 9, adnate to the lower tube, anthers oval; style and akene same as the preceding; embryo with oblong cotyledons, and short radicle.

Habitat: Dry, sandy soil near Santa Cruz, June, varying greatly in size according to soil or exposure.

14. *C. BREWERI*, Watson. "Slender, 2-4 inches high, softly pubescent, leaves ovate or rounded, 3-6 lines broad, on slender petioles; bracts foliaceous, linear-oblong, pungent; heads small; involucre 1½ lines long, the short slightly unequal divisions united at base by an inconspicuous margin, stout and curved; shortly awned; flowers 1½ lines long, glabrous or villous; segments broadly oblong, the inner ones shorter; stamens 9 at the base."

Habitat: San Luis Obispo. Copied from Watson's Bot. Cal., Vol. II., p. 36. Known only from scant specimens.

+ + Involucral divisions without scarious margins; perianth segments unequal.

15. *C. VALIDA*, Watson, l. c. Stout, 6-18 inches high, villous hairy, branching above; radical leaves oblanceolate, with long petioles, upper leaf whorls similar and shorter; involucre smooth externally, divisions slightly unequal, divergent, with straight awns; flowers short pedicellate; perianth segments exsert, unequal, oblong, outer entire, inner one half shorter, erosely denticulate; stamens 9, partly adnate to the lower tube; anthers oblong; style and akene like the preceding.

Habitat: Russian River, Petaluma, Cal. Acad. Herb. In general habit closely resembles *C. Douglasii*.

16. *C. PALMERI*, Watson, l. c. Rather slender, 4-12 inches high, hoary-pubescent, stems more or less copiously and irregularly branched above, with capitate, axillary, and terminal cymose clusters; radical leaves spatulate, with slender petioles, cauline foliaceous whorls smaller and irregular, upper bracts setaceous pungent; involucre angular, ciliate hispid on the angles, tube contracted toward the throat; divisions 6: three longer (one exceeding the others), three intermediate, smaller, all divergent, curved and uncinat; flowers short pedicelled; perianth segments partly exsert, outer deeply bilobed, inner shorter and narrowly lacinate; stamens 9, inserted on a thickened ring at the

base, anthers linear-oblong; styles slender, four times as long as the ovary, becoming exsert; embryo with ovate cotyledons and short radicle.

Habitat: Rocky hills south of Monterey to San Luis Obispo; whole plant, including the clustered involucre, reddish-purple. A well-marked species, approaching the following:

* * Erect, spreading, frequently low branched at or near the base; involucre scattered or loosely cymose-clustered; divisions unequal, not scarious margined; cauline bracts usually narrow and pungent, rarely (*C. Xanti*) foliaceous.

+ Perianth segments deeply cleft, lanceolate, with fimbriate margins.

17. *C. FIMBRIATA*, Nutt., Watson, l. c. Low branched, 3-6 inches high, appressed pubescent, purplish; radical leaves oblong, spatulate, expanded and somewhat bilobed at the summit, smooth, or more or less hairy pubescent; cauline and involucre bracts setaceous, recurved, rigidly awned; involucre scattered in the lower axils, more or less clustered above, tube cylindric, pubescent, usually strongly costate, divisions unequal, divergent and recurved, with straight or uncinat awns; flowers nearly sessile, deeply cleft; perianth segments nearly equal, exsert, with an oval terminal lobe, and irregularly fimbriate on the margins; stamens 9, at the base, anthers oval; styles three times as long as the ovary, exsert; embryo with cotyledons as long as the radicle.

Habitat: Very common on dry table-land at San Diego, April, May. Figured in Pacific R. R. Rep., Vol. V., t. 8.

18. *C. LACINIATA*, Torr. Branching near the base, 3-6 inches high, sparsely pubescent, light reddish; radical leaves spatulate, with slender petioles; cauline bracts setaceous; involucre rather copiously scattered on the upper and terminal branches; tube cylindric, pubescent externally; divisions slightly unequal, divergent, with short recurved awns; flowers nearly sessile; perianth segments conspicuously exsert, with a prolonged slender terminal lobe and narrowly lacinate margins; stamens 9, anthers broad oval; styles exserted, nearly as long as the developed akene; embryo light green, with linear cotyledons and short radicle.

Habitat: Mountain slopes toward the desert, east of San Diego; lately rediscovered by G. R. Vasey, Parish Brothers, and C. R. Orcutt. Near the preceding, but readily distinguished; of a lighter red color.

+ + Perianth segments entire, inner shorter and narrower.

19. *C. STATICOIDES*, Benth., Watson, l. c., including *C. Wheeleri*, Watson. Usually strict, with naked stems, sparingly branched above, or horizontally spreading near the base, 3-12 inches high, pubescent with appressed hairs, greenish when young, reddish-purple when mature, terminal cymes rather condensed; radical leaves oblanceolate, tapering to a longer or shorter petiole; tomentose beneath, cauline bracts acicular; involucre cylindric, with more or less prominent ribs; divisions unequal, short recurved, and uncinately awned, the lower axillary ones usually much larger; flowers nearly sessile; perianth segments partly exsert, $\frac{1}{3}$ cleft, narrowly ovate, with broad claw, internal shorter and narrower; stamens 9, rarely reduced to 6, anthers oblong; styles akene and embryo, as in other allied species.

Habitat: Dry plains throughout Southern California; the low branching forms near the coast; one of the most variable species, to include *C. Wheeleri*, Watson, which, judging from an original specimen kindly furnished by Dr. J. T. Rothrock, is only a depauperate coast form, with stamens reduced to 6, which is not uncommon in the succeeding species.

20. *C. XANTI*, Watson, l. c. Branching from or near the base, 2-12 inches high, hoary or floccose pubescent; radical leaves spatulate, abruptly tapering into a winged petiole, tomentose beneath, lower cauline bracts foliaceous, gradually passing above into setaceous; involucre scattered in the lower axils, in loose cymose clusters above, tube narrow-cylindric, densely tomentose externally, ribs more or less prominent, divisions somewhat unequal, shortly curved, and uncinately; flowers nearly sessile, with narrow tube; perianth segments partly exsert, $\frac{1}{3}$ cleft, oblong, entire, the inner one half shorter; stamens 6-9 unequally developed, anthers oval; styles and akene similar to the above; embryo nearly 2 lines long, with linear cotyledons, and slender radicle.

Habitat: San Geronio Pass; Parry and Lemmon, 1876. A low, slender form, with 6 stamens; copiously collected June, 1883, on Tehachapi Pass, more robust, with uniformly 9 stamens. Some intermediate forms from Los Angeles, Rev. J. C. Nevin, seem to connect this species with the preceding (*C. staticoides*).

* * * Decumbent, branching from the base, diffusely and dichotomously spreading above; involucre scattered, or more or less cymosely clustered; divisions unequal, variously margined and awned; perianth segments nearly equal, or conspicuously unequal; stamens 9, rarely 3; cauline bracts foliaceous or setaceous.

+ Involucres with conspicuous or narrow scarious margins to the divisions; perianth segments nearly equal.

21. *C. PUNGENS*, Benth., Linn. Trans., Vol. XVII., t. 19, f. 2. Spreading, 6-12 inches, more or less hoary or hispid-pubescent, secondary branches usually short; radical leaves oblanceolate, tapering into a narrow petiole, more or less appressed, hispid-pubescent, cauline bracteate leaves opposite, smaller and cuspidate, more pungent than above; involucres in somewhat condensed cymose clusters on the short secondary branches; tube short (1-2 lines), triangular, costate, and somewhat corrugated on the sides; divisions unequal, more or less scarious margined, shortly curved, and uncinat; flowers obconic, nearly sessile; perianth segments partly exsert, shortly cleft, oblong, entire; stamens 9, partly adnate to the lower tube; styles about as long as the ovary; embryo light green or yellow, with narrow cotyledons and short radicle.

Variety diffusa. *C. diffusa*, Benth., Watson, l. c. Branches more slender, naked, usually without foliaceous bracts; scarious margins to the teeth of the involucre broader and more petaloid, usually light pink. Santa Cruz mountains; also a smaller white form at Monterey.

Variety cuspidata. *C. cuspidata*, Watson, Proc. Am. Acad., Vol. XVII., p. 379. Involucres and flowers less conspicuous, with only scant scarious margins to the divisions. The common form on sandridges near San Francisco.

After a careful study of numerous specimens, in the field and the herbarium, I am forced to the conclusion that all the above forms should be included in *C. pungens*, the marked variations being due to differences of exposure, and not of specific value. It is somewhat remarkable that the original figure of *C. pungens*, in Linn. Trans., should be represented with *straight* awns to the involucreal divisions.

+ + Involucreal divisions without scarious margins; perianth segments slightly or conspicuously unequal.

22. *C. PROCUMBENS*, Nutt., Watson, l. c. Slender, diffusely branched from the base, 3-6 inches broad, appressed-pubescent; radical leaves narrowly lanceolate, obtuse, tapering to a slender petiole, cauline bracts setaceous; involucres scattered on the lower stems, loosely clustered above; tube short, turbinate-triangular; divisions 6: three larger, as long as the tube, three smaller, intermediate, all recurved and uncinat; flowers short pedicellate; perianth shortly exsert; seg-

ments nearly equal, shortly cleft, broad oval; stamens 9, anthers oval; embryo with oblong cotyledons and short radicle.

Habitat: Sandy soil, San Diego and southward, forming yellowish-green patches; a slender, partly erect form at Colton, near San Bernardino.

23. *C. PARRYI*, Watson, l. c. Branching from the base, 3-12 inches broad, hairy-pubescent; radical leaves ovate-lanceolate, with prominent mid-rib, appressed-pubescent; lower cauline bracts narrow foliaceous, pungent, upper setaceous; involucre more or less scattered or clustered on the secondary branches; tube short-turbinate; divisions 6, unequal: 3 larger exceeding the tube, 3 smaller, intermediate, all recurved and uncinat; flowers nearly sessile, tube short; perianth segments deeply cleft, partly exsert: outer broadly ovate, recurved, and folded, inner shorter and obscurely crenate; stamens 9, filaments hispid at base; styles and akene as in previous species; embryo with ovate cotyledons and blunt radicle.

Habitat: Gravelly plains about San Bernardino; usually associated with *C. Lastarriæa*.

24. *C. FERNANDINA*, Watson, l. c. Spreading or assurgent, 3-8 inches broad, appressed-pubescent; radical leaves lanceolate, obtuse, tapering to a short petiole, smooth or pubescent, upper cauline bracts narrow and pungent; involucre loosely scattered above; tube short, sharply costate; divisions 6, unequal, slightly divergent: 3 longer, about as long as the tube, 3 intermediate, all with straight awns; flowers short pedicellate; perianth segments partly exsert, short cleft, nearly equal, obtuse; stamens 9; styles as long as the ovary; embryo greenish, with oval cotyledons and blunt radicle.

Habitat: Alluvial soil near San Fernando railroad station. First collected by Mrs. E. A. Bush. Very closely allied to the above.

25. *C. UNIARISTATA*, Torr. & Gray, Watson, l. c. Spreading, and more or less assurgent, 3-8 inches broad, densely hoary pubescent, secondary branches forming zigzag lines, with obtuse angles at the joints; radical leaves oblanceolate, obtuse, tapering to a slender petiole, densely pubescent; cauline bracts narrow, recurved, and pungent; involucre rather copiously clustered along the branches; tube short, sharply ribbed, hairy-pubescent externally; divisions 5-6: one long straight awn, longer than the tube, and four to five short recurved and uncinat; flowers short pedicellate; perianth segments partly exsert,

unequal, the outer spatulate entire, the inner one half smaller, crenate; stamens 9, anthers oblong; styles and akene similar to the above; embryo 1 line long, with narrow cotyledons and slender radicle.

Habitat: Arid districts south of Monterey; Palmer, 1877.

26. *C. CLEVELANDI*, n. sp. Sparingly branched at base, more or less assurgent, 2-10 inches broad, hairy pubescent; radical leaves ovate-spatulate, obtuse, tapering below into a slender petiole; upper cauline bracts narrow and pungent, becoming acicular in the terminal involuclral clusters; involuclres triangular, hairy-pubescent externally; tube contracted at the throat; divisions 6: three longer, slightly unequal, divergent, and three smaller, intermediate, all shortly uncinat; flowers short pedicellate, tube oblong, perianth shortly cleft; outer segments broadly ovate, erose, and shortly emarginate, inner narrow and laciniate, mostly covered by the over-lapping outer segments; stamens 3, at the base, anthers orbicular; styles as long as the triangular akene, partly exsert; embryo $1\frac{1}{2}$ lines long, with slender, oblong cotyledons and short radicle.

Habitat: Allen Springs, Lake county, June, 1882, D. Cleveland. Ukiah, Mendocino county, August 14th, 1882, C. G. Pringle. Mrs. K. Curran, Grisley Cañon, Lake county, 1883. A very distinct species, which I take pleasure in dedicating to its first discoverer, D. Cleveland, Esq., of San Diego.

* * * * Slender, erect or decumbent, branching from the base, with tumid, fragile joints, perianth included, segments equal, in one case (*C. Lastarriae*) obsolete! stamens 3-6.

27. *C. COMMISURALIS*, Remy., D. C. Prod., Vol. XIV., p. 26. Slender, sparingly branched above, hairy-pubescent; radical leaves narrowly ovate, lanose-pubescent, a short foliaceous whorl on the main stem, cauline bracts setaceous; involuclres sparsely scattered on the upper branches, tube cylindric, evenly costate, showing an inconspicuous protuberance at the base (as noticed by Mr. Sereno Watson), the connecting membrane of the tube prolonged above as a loose fold at the throat; flowers pedicellate, short cleft; perianth segments equal, oblong; stamens 6, anthers oblong; styles recurved, as long as the ovary; embryo with narrow cotyledons, and slender radicle.

Habitat: Chili, South America. Described from specimens in California Acad. Herb.

28. *C. BREVICORNU*, Torr., Watson, l. c. Erect or ascending, 3-6

inches high, sparsely pubescent, usually branching from the base; radical and lower leaves narrowly lanceolate, with slender petioles, obtuse or acuminate, pubescent with appressed hairs; small foliaceous whorls at the lower axils, upper bracts setaceous uncinatc; involucre loosely scattered on the slender branches, tube cylindric, somewhat protuberant below, and curved at the base, inconspicuously costate, divisions 5-6, short, slightly unequal, recurved and uncinatc; flowers short pedicelled, included; perianth narrowly obconic, segments equal, short linear; stamens 3 at the base; styles as long as the ovary, akene very narrowly triangular; embryo with slender cotyledons and radicle.

Habitat: Eastern desert districts of Southern California, extending into Arizona and Southern Utah. Very slender and fragile at the joints. Difficult to examine satisfactorily, on account of its reduced characters.

29. *C. LASTARRIÆA* (*Lastarriæa Chilensis*), Remy., Watson, l. c. (and other systematic authors). Decumbent or ascending, 3-6 inches high, densely branched from the base, hispid-pubescent; radical leaves linear, obtuse, unequal, hispid-ciliate; cauline and involucre bracts, forming regular whorls of 4 to 5 unequal parts, sessile, and closely embracing the stem with prominent mid-nerve, prolonged above into an uncinatc awn; involucre (perianth of anthers) mostly concealed in the axils of the whorled bracts, scattered along the short jointed stem, tube triangular, chartaceous; divisions 5, three longer and two intermediate, all recurved, with short uncinatc awns; perianth *obsolete*, or reduced to an obscure lobed ring at the throat of the involucre, apparently adnate below; stamens 3, with short filaments, inserted on the throat, anthers small, orbicular, deciduous; styles short, recurved, akene oblong triangular; embryo with oblong linear cotyledons, longer than the straight radicle.

Habitat: Abundant throughout Southern California, and in the San Joaquin valley, to Antioch, also in Chili, South America, probably native to both. Closely related to *C. brevicornu*, and naturally closing up the *Euchorizanthæ* section. (See preliminary remarks above.)

DAVENPORT, IOWA, February 25th, 1884.

NOTE.—On receiving, recently, from Mr. C. R. Orcutt, more complete specimens of *E. Orcuttiana*, I find occasionally *two* unequally developed flowers in some of the larger involucre; so that the character of the Section *Chorizanthella*, on page 53, should be modified to "*Involucre 1-2 flowered*," and the same also inserted in the specific description, page 54. This significant fact still further confirms the necessity of a separate section, to include this well-marked group.

CONTRIBUTIONS TO THE FLORA OF IOWA.— No. VI.

BY J. C. ARTHUR.

Presented before the Davenport Academy of Sciences, February 8th, 1884.

Only phanerogams have been included, heretofore, in the present series of contributions. In this number an innovation is begun by extending the catalogue to the pteridophytes, which is to be continued, in succeeding numbers, until all the orders of lower plants, in their proper sequence, are eventually included. A large amount of material for this purpose is already on hand. The manner of cataloguing will be essentially the same as observed in the phanerogamic portion, and the whole is intended to finally present a uniform list of the Iowa flora. The numbers are continued from the catalogue of 1876 (Contr. No. I.). Their value lies in securing greater ease of reference, and in permitting subsequent discoveries to be readily referred to their approximate places in the list; for, on account of the numerous interpolations, they no longer serve to show the total number of species recorded.

The practice in the phanerogamic portion has been to use the nomenclature that accords with the latest information, but to adhere to the sequence of orders given in Gray's Manual, 5th edition. Subsequent changes of synonymy, or of previous changes not known to the writer at the time of publication, have not been recorded. On the other hand, all errors of determination have been corrected in the contribution following their discovery. This leaves the catalogue as accurate as possible in regard to the primary fact of the occurrence of the species within the State, but in some instances quite out of date in regard to synonymy and distribution. These defects can be remedied at some future time by revising the whole list, bringing the synonymy up to date, and adding the localities reported since the first publication.

In enlarging the scope of the catalogue, it becomes necessary to adopt some system of classification for the added portion. Whatever system is used, it is desirable that it be familiar to the several collectors of the State and others assisting in the work, or one easily obtained by them. That given in Bessey's "Botany for High Schools and Colleges" has, therefore, been adopted for the sequence of the orders, as

giving, on the whole, the best uniform classification, in accordance with recent views, that is accessible to all. It will be necessary, however, to reverse the order of the book, and pass from the higher to the lower forms, so as to make the added part of the catalogue continuous with the portion already published. The particular arrangement to be observed for species will be announced for each order when the first list under it is published.

The present contribution contains all the pteridophytes or vascular cryptogams at present known to occur in the State. The orders are arranged according to Bessey's Botany, and the genera and species according to Underwood's "Our Native Ferns and their Allies," a most valuable work.* The list is considered quite complete, being much larger than has before been accredited to the State. The following named ferns, however, may quite confidently be expected to occur within our borders, and the attention of collectors is specially directed to their detection: *Cheilanthes vestita*, *Asplenium ebeneum*, *A. Trichomanes*, *Phlegopteris Dryopteris*, *Aspidium Noveboracense*, *A. filix-mas*, *A. marginale*, *A. cristatum*, *A. cristatum*, var. *Clintonianum*.

The present list only covers, geographically, about one-half the State. If a nearly straight line be drawn from the northwest to the southeast corner, it will pretty accurately separate the eastern portion, the pteridophytic flora of which is quite well known, from the western portion, from which no specimens have yet been received. The northwestern part of the State consists almost wholly of treeless prairies, with few localities suitable to the growth of ferns and allied plants. What the rest of the western part of the State affords must be determined by future explorations. The State as a whole is not a favored one for such plants. They are most numerous, in both species and individuals, along the Mississippi River, and become fewer as we pass westward. The peculiarity of the flora is well indicated in the sparseness of lycopods and selaginellas, but one locality being known for the only species of *Lycopodium* yet reported, and only two localities with few individuals for the single *Selaginella*.

Much credit is due the several collectors for the trouble they have taken to obtain and forward specimens. Those communicating material for the present contribution are as follows: R. I. Cratty, of Armstrong, Emmet county; E. W. Holway, of Decorah; John Leiberg, late of Mankato, Minnesota; Prof. C. E. Bessey, of Ames; Prof. and

*To be obtained of the author, Prof. L. M. Underwood, Syracuse, N. Y.: price, \$1.25.
[Proc. D. A. N. S., Vol. IV.] 9 [May 24, 1884.]

Mrs. T. H. McBride, of Iowa City; J. G. Haupt, of Durant, Cedar county; Mrs. M. C. Carter, of Hesper; Dr. George E. Ehinger, of Keokuk; Prof. J. E. Todd, of Tabor, Fremont county; Dr. J. J. Davis, of Racine, Wisconsin; George D. Butler, of Fort Jones, California; and O. G. Young, of Raymond, Blackhawk county. Acknowledgment should also be made to several well-known botanists for determination of specimens submitted to them. Special thanks are due Prof. Bessey for placing the herbarium and other facilities of the Iowa Agricultural College at the service of the writer. Some information was obtained from an illustrated and descriptive list of Iowa ferns represented in the Agricultural College herbarium, compiled by Miss Ida Twitchell, and published in the *Aurora* (the college paper) for October, 1880, under the title of "Filices Iowenses." Credit is also due Dr. George Engelmann, Mr. R. Hitchcock, and Mr. N. L. Britton, for assistance in tracing the history of our Marsilia.

The following plants, regarding which information has been furnished by Mr. David F. Day, of Buffalo, New York, and other collectors, are reported to be in the State, but are for the present withheld from the list, because no specimens have yet been received: *Cycloloma platyphyllum*, *Corispermum hyssopifolium*, *Petalostemon villosus*, *Actinomeris helianthoides*, *Mulgedium acuminatum*, *Verbena Aubletia*, *Carex filiformis*, and *Phegopteris polypodioides*.

The next contribution (No. VII.) will contain the mosses and liverworts. Not many specimens have yet been communicated, and in the region bordering the Mississippi River, where the most material is to be expected, there are, unfortunately, few local collectors. The present additions to the previously published lists are as follows:

PHANEROGAMIA.

- 204^a *Desmodium Dillenii*, Darl. Keokuk.
- 243^a *Potentilla Pennsylvanica*, L. Lyon county.
- 270^a *Hamamelis Virginica*, L. Dubuque.
- 288^a *Opuntia fragilis*, Haw. Lyon county.
- 459^a *Artemisia frigida*, Willd. Lyon county.
- 508^a *Chimaphila umbellata*, Nutt. Hesper.
- 509^a *Ilex verticillata*, Gray. Osage.
- 539^b *Veronica serpyllifolia*, L. Iowa City.
- 540^a *Veronica arvensis*, L. Hesper; Keokuk.
- 600^a *Lithospermum arvense*, L. Keokuk.
- 624^a *Solanum rostratum*, Dunal. Fremont county; Council Bluffs.

- 640^a *Asclepias speciosa*, Torr. Emmet county.
 683^a *Polygonum tenue*, Michx. Lyon county.
 761^a *Abies balsamea*, Marsh. Decorah.
 783^a *Potamogeton pusillus*, L. Emmet county.
 794^a *Spiranthes gracilis*, Bigel. Decorah.
 853^a *Eleocharis Wolfii*, Gray. Emmet county.
 854^a *Scirpus pungens*, Vahl. Ames.
 885^c *Carex Meadii*, Dew., var. *Bebbii* (Olney). Emmet county.
 893^c *Carex Pseudo-Cyperus*, L. Spirit Lake; Emmet county.
 927^b *Buchloe dactyloides*, Engelm. Lyon county.
 927^c *Grapphephorum festucaceum*, Gray. Emmet county.
 950^b *Schedonnardus Texanus*, Steud. Lyon county.
 952^a *Agropyrum violaceum*, Vasey. Emmet county.

PTERIDOPHYTA.

ISOETACEÆ.

- 980 *Isoetes melanopoda*, J. Gay. Clinton.

SELAGINELLACEÆ.

- 981 *Selaginella rupestris*, Spring. Lyon county; Vinton.

LYCOPODIACEÆ.

- 982 *Lycopodium lucidulum*, Michx. Hesper.

RHIZOCARPEÆ.

- 983 *Marsilia vestita*, Hook. & Grev. "Near the Mississippi River."

OPHIOGLOSSACEÆ.

- 984 *Botrychium ternatum*, Swz. Charles City.
 985 *Botrychium Virginianum*, Swz. Common.

FILICES.

- 986 *Polypodium vulgare*, L. Boone county; Winnesheik county; Muscatine county.
 987 *Adiantum pedatum*, L. Common.
 988 *Pteris aquilina*, L. Common.
 989 *Cheilanthes lanuginosa*, Nutt. Winnesheik county; Dubuque.
 990 *Pellaea gracilis*, Hook. Winnesheik county; Iowa City; Charles City. Probably also at Davenport, as it is accredited to Iowa in Eaton's "Ferns of North America," on authority of Dr. Parry.
 991 *Pellaea atropurpurea*, Lk. Mason City; Fort Dodge; Des Moines; and sparingly throughout the eastern half of the State.
 992 *Asplenium angustifolium*, Michx. Delaware county.
 993 *Asplenium thelypteroides*, Michx. Iowa City; Muscatine county.

994 *Asplenium filix-femina*, Bernh. Ames; Keokuk; Winnesheik county; Emmet county; Delaware county; Muscatine county; Iowa City; Charles City. The var. *Michauxii*, Mett., in Polk and Story counties.

995 *Camptosorus rhizophyllus*, Lk. Des Moines; Ackley; Fort Dodge; Delaware county; Iowa City; Decorah; Monticello; Muscatine county.

996 *Camptosorus rhizophyllus*, Lk., var. *intermedius*, Arthur. Muscatine county.

997 *Phegopteris hexagonoptera*, Fée. Delaware county; Muscatine county; Iowa City.

998 *Phegopteris calcarea*, Fée. Decorah.

999 *Aspidium acrostichoides*, Swz. Muscatine county.

1000 *Aspidium Thelypteris*, Swz. Winnesheik county; Scott county; Iowa City.

1001 *Aspidium Goldianum*, Hook. Muscatine county.

1002 *Aspidium spinulosum*, Swz. Keokuk; Muscatine county.

1003 *Cystopteris bulbifera*, Bernh. Charles City; Winnesheik county; Delaware county; Muscatine county; Iowa City.

1004 *Cystopteris fragilis*, Bernh. Very common, as also the var. *dentata*, Hook.

1005 *Onoclea sensibilis*, L. Not uncommon from Charles City, Ames, and Keokuk, eastward.

1006 *Onoclea Struthiopteris*, Hoffm. Throughout the eastern half of the State as far south as Iowa City; also in Emmet county.

1007 *Woodsia obtusa*, Torr. Johnson county; Delaware county; Winnesheik county; Boone county; Muscatine county.

1008 *Osmunda Claytoniana*, L. Charles City; Winnesheik county; Ames; Iowa City.

EQUISETACEÆ.

1009 *Equisetum arvense*, L. Very common.

1010 *Equisetum limosum*, L. Story county; Scott county; Emmet county.

1011 *Equisetum robustum*, A. Br. Keokuk; Clinton county.

1012 *Equisetum hiemale*, L. Common.

1013 *Equisetum laevigatum*, A. Br. Emmet county.

The following descriptions are of species not given in Gray's Manual, 5th edition, nor in Underwood's "Our Native Ferns and their Allies:"

OPUNTIA FRAGILIS, *Haworth*.—Joints small, ovate, compressed or tumid, or even terete, 1-1½ inches long, fragile; larger spines 4, cruciate, mostly yellowish brown, with 4 to 6 smaller white radiating ones below; bristles few; flowers small, yellow; fruit small, with 20 to 28 clusters of bristles, only the upper ones with a few short spines; seeds few, regular.—On the Upper Missouri and Yellowstone, southward to New Mexico. *Watson in King's Rep.*, V., 119.

SOLANUM ROSTRATUM, *Dunal*.—Somewhat hoary or yellowish, with a copious, wholly stellate pubescence, a foot or two high; leaves irregularly or interruptedly bipinnatifid, some of them only once pinnatifid; corolla yellow, about an inch in diameter, hardly regular, the short lobes broadly ovate.—Plains of Nebraska to Texas. *Gray's Syn. Fl. N. Am.*, II., 231.

This has been observed by Prof. Todd in the southwestern county of the State, and by Mr. David F. Day at Omaha, fifty miles from the southern boundary. According to Prof. Todd, it occurs sparingly in gardens and about barns, and is apparently not well established. He is inclined to consider it adventitious, and it is accordingly so printed.

ASCLEPIAS SPECIOSA, *Torrey*.—Finely canescent-tomentose, rarely glabrate with age; leaves from subcordate-oval to oblong, thickish; peduncles shorter than the leaves; pedicels of the many-flowered dense umbel and the calyx densely tomentose; flowers purplish, large; corolla-lobes ovate-oblong, 4 or 5 lines long; hoods 5 or 6 lines long, spreading, the dilated body and the short inflexed horn not surpassing the anthers, but the center of its truncate summit abruptly produced into a lanceolate-ligulate thrice longer termination; column, hardly any; wings of the anthers notched and obscurely corniculate at base.—Along streams, Nebraska to Arkansas, and west to Southern Utah, California, and Washington Territory. *Gray's Syn. Fl. N. Am.*, II., 91.

The locality cited in the list extends the range of this species more than two hundred miles farther northward than has before been recorded east of the Rocky Mountains. It is one of the most conspicuous and beautiful of American milk-weeds.

ELEOCHARIS WOLFI, *Gray*.—Rhizomes very small, creeping, perennial, forming small scattered tufts; culm a foot high, slender, pale-glaucescent, striate, two-edged, one side flat, the other convex; sheath obliquely truncate, hyaline above; spike ovate-oblong, acute; scales oblong-ovate, obtuse, scarious, pale purple; style 3-parted; achenium pyriform, shining, having about 9 nearly equidistant obtuse ribs, with transverse wrinkles between; tubercle small, depressed, truncate, more or less apiculate; bristles of the perigynium [always?] none.—Margin of ponds, in very wet soil, Fulton county, Illinois, John Wolf. Probably it will prove to be not uncommon. I have specimens collected in the same region, doubtless at Athens, Illinois, in the year 1861, by Elihu Hall. Prof. Wolf, in a letter, alluded to six bristles of the perigynium, but I detect none whatever in the specimens. The spike, as to form and imbrication of the scales, is much as in *E. tenuis* and *E. acicularis*, etc.; but the achenium, with its several longitudinal ribs and delicate transverse

lineation, is upon the plan of that of *E. acicularis*. This renders the species a very peculiar and distinct one. *Proc. Amer. Acad.*, X., 77.

The species occurs sparingly at Peoria, Illinois, according to Brendel's *Flora Peoriana*, p. 85. The Iowa specimens, which agree well with the description, apparently possess no perigynial bristles.

CAREX MEADII, *Dew.*, var. *BEBBII* (*Olney*).—This was published in Olney's *Carices Bor.-Amer.*, Fasc. I., No. 22, without comments, as a variety of *C. panicea*, L., and has never, I believe, been described. The following description will enable collectors to identify the plant:

Sterile spikes with stalk two to four times its length; fertile spikes usually 2, erect, remote, slender-peduncled, rather loosely flowered; sheaths of the foliaceous bracts long and slightly inflated; perigynia and scales as in *C. Meadii*, except paler, and the former less distinctly nerved; culms slender, somewhat roughish.

Resembles *C. tetanica*, for which it is sometimes mistaken, in habit and in the loosely flowered fertile spikes, only with longer peduncles, but *C. Meadii* in the perigynia and scales; it may be merely an attenuated form of the latter. Moist prairies, Winnebago county, Illinois (*Bebb*); Chicago (*Babcock*); Racine, Wisconsin (*Davis*); and northwestwardly. Collected in Iowa by Mr. Cratty.

BUCHLOE, *Engelm.*—Flowers diceious, heteromorphous. *Male plant*: Spikes 1-sided, 2-ranked; spikelets 2 to 3-flowered; glumes 1-nerved; squamule in pairs. *Female plant*: Spikes 1 to 3, oblique in the involucre sheaths of the upper leaves; spikelets 1-flowered, crowded; lower glume of the lowest spikelet 1 to 3-nerved, the lower side adnate to the back of the upper glume; lower glumes of the other spikelets (internal as to the head) 1-nerved, free, smaller; upper glumes (external) nerveless, connate at the base with the thickened rhachis, at length like a hard, woody involucre; squamule as in male flowers; ovary lenticular, glabrous; stigmas much longer than the two erect styles.

B. DACTYLOIDES, *Engelm.*—Densely tufted, spreading by stolens, forming broad mats; culms 3 to 6 inches long. *Male plant*: Flowering stems 4 to 6 inches high; leaves nearly smooth; sheaths strongly bearded at the throat; uppermost spikelets abortive, bristle-form; lower glume ovate-lanceolate, with a scarious margin; upper glume twice longer, ovate; lower palet convex, 3-nerved, upper one 2-nerved; stamens 3. *Female plant*: Flowering stems much shorter than the leaves, 1½ to 2 inches high; 3 minute rudimentary stamens; grain free.—Elevated plains from British America to Mexico and New Mexico. *Flor. Cal., Port. & Coul.*, 147.

This is the well-known buffalo-grass. It grows sparingly in the northwest corner of the State, on thin, dry soil covering the rocks, where other plants have much difficulty in maintaining themselves.

GRAPHEPHORUM FESTUCACEUM, *Gray*.—Panicle loose, rather erect, primary branches subverticillate; spikelets oblong, about 4-flowered; glumes nearly or quite as long as the spikelets; florets terete, with clustered hairs at the base; outer palet

7-nerved, irregularly cut at the apex, forming short awns, inner palet bidentate; leaves broadly linear, flat, rough to the touch.—Carlton House Fort, on the Saskatchewan. This fine grass is considered by Dr. Torrey to be the same as the *Festuca borealis*, M. & K. The culm in our specimen is as thick as a swan's quill, 3-4 or more feet high; leaves 8-10 inches long, broadly linear-acuminate, rough to the touch. Panicle a foot and more long, almost quite erect, as well as the subverticillate slender branches. Spikelet erect, $\frac{1}{2}$ - $\frac{3}{4}$ of an inch long, scattered or subfascicled, sessile or pedicellate, generally 4-flowered. Glumes unequal, concave, rounded at the back, not keeled, the outer one shorter than the florets, acute, entire at the point, the middle nerye reaching beyond the point so as to form a short arista, there are besides, on each side, two short lateral nerves; the inner glume as long as the whole spikelet of florets, torn at the point, aristate, the middle nerve reaching beyond the point, there are besides two lateral nerves reaching to the apex, and two intermediate shorter ones. Florets cylindrical, closely placed, with a tuft of white hairs at the base of each; outer valve of the perianth jagged at the point, shortly aristate, with 7 nerves reaching to the summit; the inner lanceolate, the margin inflexed, with two strong, green, ciliated nerves at the flexures, running out so as to form a bifid apex. *Hook. Flor. Bor. Am.*

Hooker gives the above under *Festuca borealis*, M. & K. The species was first described by Willdenow and referred to *Arundo*. In 1861, Dr. Gray revised and considerably extended the genus *Grappophorum* (Proc. Am. Acad., V.), placing the present species in the first section. The Iowa specimens, communicated by Mr. R. I. Cratty, agree fully with the description, except that the spikelets are not so large, scarcely exceeding $\frac{3}{8}$ of an inch in length. Pedicels of the spikelets rough; awns formed by the nerves, especially of the glumes, inconspicuous, and sometimes barely observable. It grows 3-5 feet high in water, at the margin of lakes. The spot where found, some five or six square rods, had an abundance of individuals, and it doubtless occurs at other lakes in Iowa and Minnesota. The range given in Vasey's "Grasses of the United States" is from British America to Alaska. It is now for the first time detected in the United States.

CAMPTOSORUS RHIZOPHYLLUS, Link, var. INTERMEDIUS, Arthur.—Root-stalk short, ascending, clothed with a few dark-brown scales; stipe green, with a brown base, containing a single rounded-triangular fibro-vascular bundle without accompanying sclerenchyma; fronds subcoriaceous, thinnish; sterile frond 2-4 inches long, triangular-acuminate, sometimes prolonged and rooting, base broadly wedge-shape, apex blunt; fertile frond 4-12 inches long, narrowly lanceolate, broadest close to the base, greatly attenuated and prolonged, rooting at the apex; base acute, broadly wedge-shape, never cordate; veins strongly ascending, anastomosing and forming about two series of areolæ; sori few, oblong, sometimes in pairs, or confluent at the upper part of the areolæ; indusium smooth, delicate, with a sinuous margin; spores ovoid, with broad anastomosing wings of irregular width.—Sterile blade

$\frac{1}{4}$ – $\frac{1}{2}$ inch broad near the base, fertile blade $\frac{1}{4}$ – $\frac{3}{4}$ inch broad. Limestone cliffs in Eastern Iowa. *Bot. Gaz.*, VIII., 199, Plate III.¹

Resembles *C. rhizophyllus*, but may be readily distinguished by the solitary axial bundle of the stipe, destitute of the extra-fascicular sclerenchyma, the thinner and narrower fronds, acute base, simpler venation, and short sori. The typical form has two distinct bundles at the base of the stipe, which coalesce above into one; these are accompanied by a dark thread of sclerenchyma situated outside each bundle, and usually anterior to it, which unite to form a single thread after the union of the bundles, or, when lateral, remain as distinct lateral threads. In the variety the bundle is simple throughout, and has no external sclerenchyma. Again, in the typical form the base of the frond is never strictly wedge-shape, as in the variety, but, however much reduced, has still some indication of auricles. It is the opinion of Mr. George E. Davenport (in litt.) that this "is only a weakly growth, in which the plants have simply failed to develop their full characters," a conclusion which some of the facts do not appear to corroborate. The small area covered by the plants was within a few yards of as large and thrifty a growth of the typical walking-leaf as one is likely to find. Small plants have been gathered by the writer and others in various parts of the State, but none of them show the distinctive characters of the variety. A specimen in the herbarium of the Chicago Academy of Sciences, collected by A. H. Curtiss in Virginia, more nearly approaches the variety in external appearance than any other yet seen by the writer; the fibro-vascular bundle, however, is in every respect typical. If this be only an individual form, it is still interesting, as all the deviations from the type are in the direction of the Sibirian species, *C. Sibiricus*, the only other species known. The walking-leaf is not a rare fern in Iowa, and the discovery of the variety in other localities may confidently be expected.

CORRECTIONS AND EXPLANATIONS.

The following are corrections of previous contributions and some additional notes on the present one:

In Contr. No. V., for *Emmett Co.*, read *Emmet Co.*

Aphyllon fasciculatum (No. 523) is to be dropped from the catalogue. Upon re-examination, the specimens prove to be the same as No. 522^a of Contr. No. II. It (*A. uniflorum*, T. & G.) is a very rare plant in the State.

Polygonum tenue, Michx. (No. 683^a), has a number of times been reported with specimens from various parts of the State, but has always heretofore proved to be a small form of the abundant *P. ramosissimum*. The true *P. tenue* is, without doubt, a rare plant in Iowa. The region from which the present specimens come, the extreme northwestern corner, is geologically and botanically very unlike the rest of the State.

Potamogeton pusillus, L. (No. 783^a), is said by Mr. Morong to be the typical form, but what has generally been called *var. vulgaris*.

Schedonnardus Texanus, Steud. (No. 950^b) is described in Gray's Manual under the name of *Lepturus paniculatus*, Nutt. See "North American Genera of Grasses," by F. L. Scribner, in Bull. Torr. Cl., IX., 134, and X., 8; also, "Grasses of United States," by George Vasey, 1883, p. 32.

Agropyrum violaceum, Vasey (No. 952^a), is described in Gray's Manual under the name of *Triticum violaceum*, Horn. See Vasey's "Grasses of the United States," 1883, p. 45.

Isoetes melanopoda, J. Gay (No. 980), was collected near Clinton by Dr. George Vasey in 1862, and specimens are now in his herbarium in Illinois. They were determined by Dr. Engelmann. No other specimens are known to have been collected in the State. The plants, being grass-like in appearance, are doubtless overlooked. The Iowa specimen is cited in Engelmann's "Isoetes of North America," p. 3.

Marsilia vestita, Hook. & Grev. (No. 983), is given solely on the authority of "Wood's Class-book of Botany" (editions of 1860 and 1869), p. 810, which says that it was "sent from Iowa, near the Mississippi River, by Dr. Cousens." Probably no other specimens than those referred to have been collected in the State. The citation of Iowa under *M. vestita* in Underwood's "Our Native Ferns and their Allies," p. 115, is on the same authority, as I am informed by the author. In Wood's "Botanist and Florist" (1870), p. 360, a later publication than the "Class-book," we find that Iowa is credited with *M. uncinata*, Br., with no reference to *M. vestita* of the "Class-book," or to Dr. Cousens' specimens. Inquiry at the College of Pharmacy, in New York City, where Prof. Wood's herbarium is now deposited, discloses the unfortunate fact that many of the specimens were considered worthless, when the herbarium recently came to be mounted, and were destroyed, and that as the specimens in question cannot be found, they were doubtless among the discarded ones. We have therefore no direct way of determining with

certainty what form of *Marsilia* was really collected, or in what locality it was found. A review of the few instances in which specimens of *Marsilia* have been collected in this region will, however, afford some slight assistance. A *Marsilia* appears to be comparatively abundant in Dakota. It was first found in 1839 by Geyer, of Nicollet's Expedition, in "dry swamps in the prairies near Devil's Lake," Northern Dakota. Torrey, in the report of this expedition, p. 166, determined it to be *M. vestita*, and specimens are in both the Torrey and Chapman herbaria at Columbia College, New York City. A. Braun, however, referred it to *M. mucronata* in an account in *Monatsberichte der Akademie*, Berlin, 1863, p. 423, and adhered to the same opinion in a fuller account in the same publication of 1870. Sterile specimens of what may be the same species were gathered by Mr. J. M. Holzinger in July, 1883, near Pierre, in Central Dakota, in a ditch by the railway track on the prairie. The specimens are now in my possession. Michaux collected a sterile specimen in Illinois, still in the Michaux herbarium, which A. Braun doubtfully refers to *M. mucronata* (l. c., 1870), but it has not been detected since. These are all the specimens known to the writer to have been collected nearer us than Arkansas. We may conclude that there is little doubt that either *M. vestita* or *M. mucronata*, or it may be both, will finally be found in Iowa. The two are much alike, and Braun seems to have arrived at the opinion that they can scarcely be specifically distinct, a conclusion adopted by Watson in the "Botany of California," p. 351, where the latter is made a form of *M. vestita*. *Marsilia* has slender, creeping stems, leaves closely resembling those of white clover, but with four leaflets instead of three, fruit the shape of a bean, and nearly half the size of one, and commonly grows in shallow water or mud. As with *Isoetes*, so with *Marsilia*, it has probably been overlooked; and the main reason for inserting *M. vestita* in the present list without accompanying specimens, which is contrary to the established rule, is to bring the matter to the attention of local collectors.

Botrychium ternatum, Swartz (No. 984), was found by the writer in August of 1881. Only a single plant was discovered, which grew in an open pasture. The specimen was unfortunately dropped and lost before reaching home. Judging from memory of the hasty examination made when in hand, it belonged to sub-variety *intermedium* of Eaton. The plant was nearly a foot high, and had a close resemblance to the figure given in Eaton's "Ferns of North America," Vol. I., Pl. XXa, of a specimen of this variety from Shelbourne, N. H. It is undoubtedly rare in Iowa. The only other instance of its having been found in the

State is that recorded by Miss Mary E. Wood (Bot. Gaz., VII., 73), who reports it from the Maquoketa River, about fifty miles west of Dubuque, but I have seen no specimens.

Phegopteris calcarea, Fée (No. 998), is "closely related to *P. Dryopteris*, the principal differences being a somewhat thicker root-stalk, glandular stalk and fronds, fronds more rigid and erect, and smaller pinnæ on the lower side of the primary divisions" (Eaton). It is not uncommon in Europe, but the only localities known in North America are a station on the St. Louis River, in Minnesota, and a spot of a few yards square at Decorah. The Decorah specimens are specially fine and well developed. It is to be looked for on limestone cliffs, particularly those facing the north. Mr. Davenport, in his Supplement to the Catalogue of the Dav. Herbarium (March, 1883), writes the name *P. Dryopteris*, Fée, var. *Robertianum* (Rupr.), and gives the history of the synonymy, maintaining that it is not entitled to specific rank.

Aspidium spinulosum, Swartz (No. 1002), in the comparative size of the pinnules and the markings of the spores in the Iowa specimens, approaches var. *dilatatum*, which variety will doubtless be found eventually within the limits of the State.

Cystopteris bulbifera, Bernh. (No. 1003), shows an interesting variation in a specimen received from Muscatine county. The under surface of the frond is unevenly glandular, and the usually smooth bulblets are clothed with dark brown lanceolate scales (paleæ), half as long as the length of the bulblets, each scale tipped with a colorless, globular, usually stalked gland, and with or without 1 to 3 similar glands on either side, near the base.

SPIRIT LAKE, IOWA, December, 1883.

ON A NEW GENUS AND SPECIES OF BLASTOIDS,

With Observations upon the Structure of the Basal Plates in
Codaster and *Pentremites*.

BY CHARLES WACHSMUTH.

[This article, which appeared in the Geological Report of Illinois, Vol. VII., p. 346, has been revised by the author.]

Among some interesting new Blastoids lately sent to me for investigation by Rev. W. H. Barris, of Davenport, Iowa, collected by him in Northern Michigan, I found one type which seemed to me of unusual interest as representing a form intermediate between *Codaster* McCoy and the new genus *Phenoschisma* Ether. and Carp. At my request, Mr. Barris not only kindly permitted me to describe the species, but he very liberally furnished me a number of specimens, which he allowed to be cut for sections. Before giving the description of the form, I wish to make a few remarks upon the terminology employed in this and the succeeding paper by Mr. Barris.

Since the appearance of Prof. F. Roemer's classical work upon the Blastoidea, his terms, with slight variations, were used, both in this country and in Europe, by the leading paleontologists. Roemer's terms are no doubt appropriate, but they have the great disadvantage of giving new names to certain parts, which, in allied groups, had previously received a proper designation. All parts having a common origin should always be called by the same name. Special terms, unnecessarily introduced, lead to the impression that the differences among the groups are greater than they really are, and they form a serious obstacle to an easy perusal of the works of different writers.

Messrs. Etheridge and Carpenter have lately published, through the Ann. and Mag. Nat. Hist., April, 1882, an interesting paper, "On certain points in the Morphology of the Blastoidea, with descriptions of some new Genera and Species," in which they explain the terms which they propose to use in their writings. Their terms are in conformity with those now in use for Crinoids and other Echinoderms, and it

would be of great advantage to science if they were universally adopted by future writers upon Blastoids. In order to give this terminology a wider circulation, and for the better comprehension of the succeeding descriptions, I give here an abstract of their principal terms:

The "*calyx*," according to Etheridge and Carpenter, is composed of the "*basals*," the "*radials*" or forked pieces, and the "*orals*"* or deltoid pieces. The suture between basals and radials is the "*basal-radial suture*;" the more or less strongly marked ridge at the median line of each oral is the "*oral ridge*."† In the fork-shaped radials, the handle of the fork is the "*body*" of the radial, the two prongs are the "*limbs*;" between the limbs is the "*radial sinus*," which is occupied by the "*ambulacrum*." Of the ambulacral structures, which together fill up the radial sinus to a greater or less extent, the most important is the "*lancet-piece*," which is excavated lengthwise by the "*food-groove*" or ambulacrum proper. Upon or against it rest the "*side-plates*," pore-pieces of Roemer; they are marked by minute pits, the "*pinnule pits*" or sockets, which must not be confounded with the marginal pores or

*The term "*orals*" for the deltoid pieces was proposed by Wachsmuth and Springer in Part I. of their Revision, and afterwards adopted by Prof. Zittel and by Messrs. Etheridge and Carpenter.

Since the publication of the present article, I became fully convinced that the so-called deltoid pieces are not oral plates, but true interradials, and that, as such, they form a part of the abactinal system. If the deltoids were actinal plates, and this they should be if they were orals, the actinal regions in *Eleacrinus obovatus* would extend to over three-fourths of the entire body—a proportion almost equal to that of Echini. On the contrary, in the allied *Granatocrinus Norwoodi*, with small deltoids, and in *Heteroschisma gracile*, the actinal system excluding the ambulacra, would be limited to a small area around the oral pole, and occupy scarcely more than a twentieth part.

The different proportions of the actinal and abactinal regions among Echinoderms were looked upon by Prof. L. Agassiz as determining the different outlines of the various "*orders of this class*," and he has ranked these orders according to the greater preponderance of the one or the other of the two regions. In the Neocrinoidea, the oral and aboral regions are proportioned almost equally, and this is the case not only in the adult, but is to be observed already in the Pentacrinoid-larva. In the Palæocrinoidea, the abactinal regions, as a rule, are considerably contracted, and in the lower organized Blastoids they are reduced still more. Plates of such enormous dimensions as are found occasionally among the deltoids, cannot possibly form a part of the actinal system in so low a group as the Blastoids, and hence cannot be orals. That they are true interradials is proved by the relative position which they occupy to the interradials of the Palæocrinoidea. Like those plates, they rest upon the upper sloping sides of the radials, and extend, whether consisting of a single plate as in the *Cyathocrinidae*, or of a series of pieces as in *Actinocrinidae* and *Rhodocrinidae*, into the ventral side, to a series of plates, which were designated by W. and Sp. as central piece and proximals. All of these latter plates are actinal pieces, and it is evident, if the oral of the Neocrinoidea are at all represented in the Blastoids, that they must be contained among their number. Whether they were represented, and by which of those plates, are questions which cannot be answered within the limits of a note. The discussion of these questions I must leave to the third part of the Revision, in which the oral plates generally will receive special attention.

†It is self-evident that the "*oral ridge*" of Ether. and Carp. should be called the *interradial* ridge.

"*hydrosfire-pores*." The supplementary pore-pieces of Roemer are the "*outer side-plates*." Beneath the ambulacral fields are the "*inter-radial systems of lamellar tubes or hydrosfires*." The openings of these tubes, if directly on the ventral surface of the calyx as in *Codaster*, are called the "*hydrosfire-slits*;" if they are concentrated beneath the ambulacra as in *Orophocrinus*,* the gap between the edge of the lancet-plate and the sides of the radial sinus is the "*hydrosfire cleft*." This leads downward into the "*hydrosfire canal*." The canals open externally by the "*spiracles*," formerly called ovarian openings. The spiracle or spiracles of the anal interradius may be confluent with the anal opening to form the "*anal spiracle*." The plates covering the mouth and peristome, and which are sometimes continued down the ambulacra covering the food grooves, are the "*summit plates or the vault*."

They further use the term "*oro-anal side*" for the upper truncate regions of the body, and they include herein the ambulacra.

It has been asserted by Mr. Lyon (Owen's Kentucky Rep., Vol. III., p. 468), that in the genera *Codaster* and *Pentremites* the plates generally known as basals consisted of two successive series of pieces, and upon this ground he proposed a new formula for the two genera. Only to the "lower series" of plates he applied the term basals; the "upper series" he called first radials. He explains the deficiency from five to three in the number of the latter plates, and the irregularity which he found in their form and position, compared with other radials, that the two equal hexagonal pieces were perfect plates, and the third smaller pentagonal one, imperfect. According to his theory, there were no first radials in two of the rays, and the rays commenced with a second radial. This curious interpretation of the plates, as might be expected, found no followers, but his view that in some of the Blastoids the plates formerly called basals were composed of two series of three pieces each, was afterwards accepted by Billings (Amer. Journ. Sci. and Arts, July, 1869), and also by Meek and Worthen (Geol. Rep. Ill., Vol. V., p. 464). The former regarded the "lower pieces" as basals, the "upper ones" as subradials; while Meek and Worthen, in re-describing *Orophocrinus* (*Codonites*) *stelliformis*, O. and Shum., distinguished the two series as basals and supplementary basals, the latter to be applied to the "lower series." They objected to the name subradials from the fact that the plates do not alternate with each other.

* Meek and Worthen, in defining, in 1869 (Geol. Rep. Ill., Vol. V., p. 464), the genus *Codonites*, were evidently not aware that Von Seebach had proposed, in 1864 (Nachr. K. Geselloch. zu Goettingen, p. 110), for *Pentremites stelliformis* Owen and Shum. the genus *Orophocrinus*. The latter has since been adopted by Ludwig, Zittel, and by Etheridge and Carpenter.

In the course of their remarks they made the peculiar statement that the lower series or supplementary basals "*were in adult specimens of Codonites stelliformis as solid as we find them in Pentremites; young individuals, however, show clearly that they are actually composed of five or six of the upper joints of the column, enlarged and anchylosed together.*" Meek and Worthen undertook to prove this by a moderately small specimen, in which five or six joints of the column were preserved, and in the same direction divided longitudinally into three sections. It should be stated that the specimen, which was formerly in my collection—now in the Museum of Comparative Zoölogy at Cambridge—is not much below medium size, and, therefore, cannot by any means be called a very young specimen. The column, as far as preserved, consists, as in most Blastoids, of remarkably short joints with sharp edges, and the joints are separated by rather deep notches; the longitudinal sutures are not shown distinctly, but probably do exist in the specimen.

If it were true, as Meek and Worthen asserted, that in "*Codonites*" the five or six upper joints became anchylosed in more adult specimens, and were transformed into solid plates, it is very singular that no transition forms have ever been found in this or any other allied species. I think a metamorphosis like this would have undoubtedly left traces of the columnar joints in the growing animal, especially since the modification, as we may safely suggest, took place gradually, and joint by joint; but although I have examined more than fifty specimens of this species, I could not find the remotest traces of former stem joints, or of a suture; all that I have been able to discover is a slight angular depression around the lower end of the cup. This depression, which has somewhat the appearance of a suture, is caused by the more rapid spreading of the upper portions of the basals. Such, at least, is the case in some species of *Codonites*, *Codaster*, and *Troostocrinus*, in which the base appears as if it might be dicyclic, but actually is monocyclic, and in which the lower part is almost cylindrical, and resembles an elongate columnar joint, while the upper part is conical.

It seems to me that this upward spreading of the basals can be naturally explained by the growth of the animal. The form generally throughout the Blastoids is in a young specimen more elongate than in the adult, and after attaining a certain growth, the calyx increases in height comparatively little, while the ambulacra still grow considerably longer. This disproportion in the growth of the different parts is

equalized by the increase of the body in width, by which the ambulacra attain a greater curvature, pushing the basals, and partly the radials, from a fairly sloping position to a more horizontal one, as shown in the following species, of which I have examined a large number of specimens in all stages of growth.

In the young *Orophocrinus stelliformis* the ambulacra occupy only the upper truncate side of the body, the lower portions are turbinate with nearly straight sides; in very old specimens, however, the ambulacra curve so strongly, and reach down so deeply, that the radial lips were brought into a horizontal position, almost to the level of the basals, and the sides of the body became concave, thereby pushing the upper portions of the radials in a more outward direction.

Schizoblastus (Granatocrinus) melo O. & Shum. is in its younger stages elongate-ovate, in medium sized specimens subglobose to globose, and in large specimens depressed globose. The same modifications, but perhaps not quite so marked, take place in *Granatocrinus Norwoodi* O. & Shum. and in *Schizoblastus (Granatocrinus) Sayi* Shum.

Pentremites Godoni De France in its earlier stages is pyriform, and resembles *P. pyriformis* Say; later on it is globose. The lower portions, from the basals to the radial lips, are broadly turbinate and decidedly longer than the summit portions. Afterwards they become almost horizontal, and occupy in large specimens more than three-fourths the height of the body, at a time when the ambulacra, which at first were scarcely longer than wide, attain a length of more than three times their greatest width.

The modifications which here take place in the basals and radials are mainly produced by the increase in the length of the ambulacra. These plates, and particularly the basals, had acquired already at an early age a comparatively large size; later on the body of the radials increased much less in length than in width, as shown by the lines of growth, which are sometimes exposed. The basals, however, which had attained almost their full height, and now had to accommodate themselves to the increasing width of the radials, bend outward, producing thereby the angularity at the outer side of the radial cup, by leaving the lower thickened portions, which were less pliable, in their former position. This explains fully the case as we find it in *Codonites*, *Codaster*, etc.; in *Pentremites*, however, under similar conditions additional modifications have taken place.

Restricting the genus *Pentremites* to species with large petaloid am-

bulacra, most of them have at the lower end, at the junction with the column, a little projection in form of a cone, which is almost as prominent in small specimens as in larger ones. This cone constitutes the lower part of what appears to be a tripartite plate, in form of a clover-leaf, occupying the central portion of the basal disc, into which it extends for some distance, following its curvature. It is frequently somewhat elevated above the general surface of the basals, and can be observed in most specimens with the naked eye. The sutures which separate the basals by their shorter sides, in the usual way, divide the lower leaves lengthwise. From external appearance, one feels very much inclined to take the inner part of the basals to be an independent series of plates; but on grinding the surface there is no intermediate suture. In one of my specimens, which I take to be an extremely large specimen of *Pentremites Godoni*, I find within the clover-leaf another leaf-like structure, but of less width, and beneath it eight joints of the column, divided longitudinally in the same direction as the basals. The inner leaf is at its border as distinctly marked as the outer one; it extends not far beyond the column, but is considerably wider, and very much higher than the stem joints, which are so extremely short that there are eight joints to a length of half a line. The structure is such that there can be but little doubt that the inner leaf, although differing considerably in its dimensions from the succeeding stem-joints, is actually nothing else but the proximal joint, which had become enlarged and gradually anchylosed with the basals. It is quite evident that the outer clover-leaf had a similar origin. At the outer leaf the sides of the anchylosed joint were more extended, and became almost entirely absorbed into the basal plates, leaving only external marks, while at the inner ones the column structure can yet be recognized, although the joint has here actually become a part of the basal plates. This is the only specimen in which I have observed a second series of plate-like marks, and I do not know whether this instance represents an abnormal case, or is owing to the extreme size of the specimen; at any rate, it gives an explanation how similar marks were produced.

In corroboration of these views, I will further direct attention to *Pentremites abbreviatus* Hambach, a very depressed species, in which the basals, even in young specimens, have an almost horizontal position, and in which, as might be expected, there is no conical projection at the end of the basals. In this specimen, the leaf-like marks are very large and conspicuous; they form a somewhat triangular, clover-

leaf-shaped disc, with rounded extremities directed to the basal sutures. The sutures are always slightly depressed, and the parts covering these depressions stand out so prominent that it appears almost as if, in this case, exceptionally, the anchylosis had not been completed; and in fact I found two specimens in which the upper structure apparently had partly fallen out, leaving in its place, at the surface of the basal plates, a clover-leaf-like impression. The place to which the column was attached is generally well marked; and in one specimen I found remains of the proximal segment, which is exceedingly thin and delicate, and, like the anchylosed joint, triangular in form, but the points of the angles directed toward the sides of the upper one.

I think this fully sufficient to prove that the so-called supplementary basals in *Pentremites* consist of a columnar joint, anchylosed with the basals and more or less completely absorbed into the plate, and that the basals in the Blastoids generally were monocyclic and not dicyclic. This seems to be also the opinion of Etheridge and Carpenter, although they state distinctly that they wish to leave the question for further consideration.

HETEROSCHISMA Wachsmuth, Nov. gen.

The form under consideration is closely allied to *Codaster*, and approaches *Phenoschisma*, Ether. and Carp. The latter, according to Etheridge and Carpenter, differs from *Codaster* in the following points: "In the partial exposure of the hydrospire slits, and in their presence in the anal interradius, as well as in the four others. *Phenoschisma*, in consequence, possesses ten groups of hydrospires, whilst *Codaster* has only eight. Further, the former genus has relatively smaller orals than the latter, and it may possess outer side-plates to the ambulacra." (Ann. and Mag. Nat. Hist., April, 1882, p. 227.)

Heteroschisma stands intermediate between the two forms; it agrees in the above characters with *Phenoschisma*, except that it has but eight groups of hydrospires in place of ten.

Admitting that the difference in the number of hydrospiral groups alone is sufficient for a separation from *Codaster*, the intermediate form must be placed either together with that genus, or be arranged under a new name. I follow the latter course, as I consider the structural differences in the so-called "oral plates" morphologically as important as the difference in the number of the hydrospires. In the typical form of *Codaster*, including the more flat-topped species with large inter-radials, the latter plates cover almost the whole of the truncate upper

face of the body. They rest with their lateral sides against the inflected upper part of the limbs, and form more or less strongly marked edges or elevated angular ridges, which extend out interradially from near the oral opening to the end of the plates. The hydrospires are placed to both sides of the so-called "oral ridges," and are all located within the limits of the interradials, only small portions of them being continued along the sides of the limbs. In the more clavate form with small interradials, for which I have proposed the generic name *Heteroschisma*, the "orals" are only partly exposed to view, the visible part occupying a small space around the mouth, the concealed portions, which give origin to the two inner hydrospires, being overlapped by the ends of two contiguous limbs. There is in *Heteroschisma*, in the proper sense of the word, exteriorly no "oral ridge," as the edge is here formed by the limbs. The limbs are extended interradially into high pyramids with steep sides, of which two of the walls form the sides of the radial sinus. The hydrospires are located, with the exception of the two inner ones, within the pyramids, being exposed along the sides of the sinus, nowhere connecting externally with the interradial plates. In *Codaster* the hydrospires enter the body nearly at right-angles, and the walls are placed almost parallel to each other. In *Heteroschisma* the hydrospires stand obliquely to the sides of the sinus, and they are arranged closely around the mouth, while those of *Codaster* are placed away from the mouth. The differences between the two genera and the allied *Phenoschisma* are shown in the accompanying table:

GENERA.	HYDROSPIRES.		AMBULACRA.		INTER- RADIALS.		INTERRADIAL- RIDGE.	
	Eight groups.	Ten groups.	Side-plates meet sides of sinus.	Side-plates do not meet sides of sinus.	Large.	Small.	Formed by interradials.	Formed by the limbs.
<i>Codaster</i>	*	*	*	*
<i>Heteroschisma</i>	*	*	*	*
<i>Phenoschisma</i>	*	*	*	*

Heteroschisma includes the following species: *Heteroschisma gracile*, the type of the genus; *Heteroschisma alternatum*, and *H. alternatum*, var. *elongatum*, Wachsmuth,* all from the lower part of the Hamilton group, Devonian.

*Dr. Knapp, of Louisville, Kentucky, had the kindness to send me, for examination and study, his large collection of Louisville Codasters, consisting of nearly forty specimens, in all stages of growth, and embracing at least two well-marked species. Lyon, in describing his

HETEROSCHISMA GRACILE Wachsmuth, Nov. Sp.

*Heteroschisma gracile* WACHSMUTH.

Fig. 1, side view of a specimen. Fig. 2, horizontal section of the hydrospires. The first figure enlarged three diameters, the other five.

Body subclavate or irregularly pyriform, pointed at the base, deeply excavated in the direction of the rays. From the foot of the basals to the radial sinus the form is elongate-obconical, the sides straight, or nearly so. The radials are arched, with an angularity along the median line, which culminates in the lips, but almost disappears on

Codaster alternatus (Owen's Geol. Rep., Vol. III., p. 493), evidently took all Louisville Blastoids containing hydrospire slits to belong to only one species, and this makes it difficult to ascertain now to which of the forms the name should be applied. His generic figure, on Pl. V., Fig. 3, represents, undoubtedly, the form which afterwards was described by Shumard as *Cadaster pyramidatus* (Acad. Sci., St. Louis, Vol. I., No. 2). Lyon's Fig. 3 *b* gives a small specimen of the same species; his Fig. 3 *a*, however, is not only an entirely different species, but a *Heteroschisma*. It might appear that the form represented by the first figure should receive Lyon's name, but this would do injustice to Shumard, the more as Lyon's descriptions are fitted for neither the one form nor the other. It must be further considered that the latter form, which, like *Heteroschisma gracile*, has small interradians and large pyramids formed by the limbs, is readily separated again into two sections, the one larger, more elongate, and decidedly clavate, with nearly straight sides; the other smaller, with convex sides, and somewhat larger and more prominent interradian plates. Under these circumstances, I would be probably justified to drop Lyon's name entirely, but, not wishing to overburden the literature unnecessarily with names, I propose to apply his specific name to the smaller form, as this is probably represented by Fig. 3 *a*, and which will be known as *Heteroschisma alternatum*. The larger type, which possibly may represent a more adult form of the other, but more probably is a good variety, or even an entirely distinct species, can be distinguished as *Heteroschisma alternatum*, var. *elongatum*, which may be changed into *H. elongatum*, should the above characters be considered sufficient for specific distinction. Shumard's species is easily recognized by being much more flat-topped, that it has large interradians, and these abutting against the deflected upper ends of the limbs, and that the radials generally possess along the lateral sutures, near the margin, one or more rather deep, longitudinal grooves. Lyon, in asserting that the hydrospiral grooves were "probably capable of being compressed or impressed," made the mistake of taking specimens of *Codaster pyramidatus* as the compressed, and those of *Heteroschisma alternatum* as the impressed, condition of his species. It should be further remarked that none of the Louisville specimens, upon which Lyon based his dicyelic base in *Codaster*, show any such structure.

approaching the basi-radial suture. Intermediate between the ambulacra there are five pyramids, formed by the junction of the adjacent limbs of two contiguous radials, without the assistance of interradial plates. Four of them are sharply pointed, projecting conspicuously above the level of the summit; the fifth, the one containing the anal orifice, is a little lower and truncate. Ambulacra placed at the bottom of a deep sinus, curving gently in an upward direction. Greatest width of the body across the lips, where the section is strictly pentagonal, while it is obscurely triangular across the basals. Average length and width, as taken from eleven specimens, as eight to ten to five; actual length, from three to six tenths of an inch. Surface of the plates perfectly smooth, without ornamentation.

Basals long, in form of an elongate cup; column-like, extended at the lower end; upper face somewhat excavated for the reception of the radials, with an obtuse angle beneath their juncture.

Radials moderately increasing in width to the sinus. The length of the radial body equal to, or surpassing, its greatest length, and equal to the length of the basals. The limbs occupy less than one-third the entire length of the plate; they are slightly bent inward, those of two contiguous radials forming a triangle, of which the horizontal side (between the lips of the adjoining radials) is but little longer than the two lateral sides. At the azygous interradius the upper angle is truncated by the anal aperture, and the outer side of the pyramid is more sloping. Sinus short, and remarkably deep.

The interradial plates are small, and only partly exposed to view, one-half or more of each one being hidden beneath the radials. The exposed part, which consists of barely more than what might be called the lips of the mouth, is slightly projecting along the margin; it is in form rhomboidal, but the angle toward the radials is covered by the tips of the overlapping limbs. The concealed portions are longer than wide, and their distal end is somewhat extended outward and downward. The description of the interradial plates was made from a specimen in which the greater part of the limbs had weathered away, thereby exposing the parts underneath. As seen in this specimen, the lateral sides give off the two inner hydrospires in each group, but not the others. The interradial plate of the azygous side is constructed somewhat different. The parts which are covered by the limbs, and form the ridges, take here a more inward direction, and compose the sides and inner floor of a little cavity, which forms the entrance to the anal aperture. The opening into this cavity is large, somewhat broadly sub-

triangular, and there is a passage in a downward course, which enters the inner body at the end of the interrarial plate.

The ambulacra are almost linear, rounded at the distal end; they rest deeply between the steep sides, the side-plates meeting the sides of the sinus at least toward the upper end of the ambulacrum. They connect with the body through the lower side of the lancet-piece, close to its middle line. The surface of the ambulacra is divided by the food-groove only, there being no other indented lines toward the sides, such as seen in the Louisville species. The lancet-piece is entirely covered by the side-pieces, it is lanceolate, and rests with its proximal end, which is angular, between—and partly upon—adjoining interradians. The number of side pieces varies from 16 to each side in the smallest specimens to 22 or 23 in the largest ones, each one with a socket, probably for the reception of a pinnule. There are also outer-side pieces, but no hydrosipre pores. The oral aperture is pentagonal and comparatively large.

The hydrosipres are arranged in eight groups, of from 8 to 9 to each set, and there are as many slits along the sloping sides of the radial sinus. The two inner slits, which are longer than any of the rest, are concealed from view by the overhanging sides of the lancet-piece. The succeeding ones are visible externally, and decrease in length with the decreasing width of the sides along the sinus. Not all, however, decrease in that proportion; this is only the case with the four or five outer ones, of which the outermost is but little longer than wide; the preceding three, from the fourth inward, are nearly of equal length. It should also be remarked that the slits have an irregular outline even in the best preserved specimens, and it appears as if there had been pores in place of the slits. Each slit opens into a sac; this, however, is so narrow that the walls almost touch each other, except at the lower end, where it attains almost the width of the alternating folds of the hydrosipres. There is a great difference in the depth of the sacs; the two inner ones extend into the body for a comparatively short distance, all succeeding ones increase their depth in the same proportion as they grow shorter upon the surface of the body.

Remarks: *Heteroschisma gracile* is in its form and general habits almost identical with *Phenoschisma Verneuilli* Ether. and Carp., but it has eight groups of hydrosipres, and not ten. It differs from both *Heteroschisma alternatum* and *H. elongatum*, in that the summit of the pyramids extend considerably above the oral crests, while in

the two others the summit scarcely reaches the level of the peristome; it also has narrower, almost linear ambulacra, against slightly petaloid ones in the others, and these are divided by the food-groove only; while all Louisville species have three indented lines along their surface. It further differs from *H. alternatum* in having straight, and not convex, sides along the calyx, and a conical, more sharply pointed basal cup.

It is barely possible that *Pentremites subtruncatus*, Hall (Geol. Rep. Iowa, Vol. I., Pt. II., p. 485), is identical with this species. A comparison is impossible, as Hall's description is so indistinct that not even the genus can be identified. He refers it to forms like *Pentremites Rheinwardti*, and mentions "ovarian openings," which, if present, suggest a very different thing. Should, however, hereafter, the identity be proved, the name must be placed as a synonym under *Heteroschisma gracile*.

Position and locality, etc.: Found near the top of the Hamilton group, Alpena, Michigan.

[The type specimens are in the collections of Prof. Barris and Charles Wachsmuth.]

DESCRIPTIONS OF SOME NEW BLASTOIDS FROM THE HAMILTON GROUP.

BY W. H. BARRIS.

ELÆACRINUS Roemer.*

- SYN.—*Pentremites* Troost, 1841, 6th Rep. Geol. Tennessee.
Nucleocrinus Conrad, 1843, Jour. Acad. Nat. Sci. Phila., Vol. VIII., p. 280.
Olivanites Troost, 1850, Cat. name.
Elæacrinus Roemer, 1851, Monog. Blastoidea, p. 55.
Olivanites Lyon, 1857, Geol. Surv. Kent, Vol. III., p. 490.
Nucleocrinus Lyon and Cass., 1859; Hall, 1862; Shumard, 1862.
Elæacrinus Shumard, 1866, Trans. St. L. Acad. Sci., p. 368.
Nucleocrinus, *canadensis*? Montgomery, 1881, Can. Nat., Vol. X., No. 2.

ELÆACRINUS OBOVATUS Barris, Nov. Sp.

PLATE I.—*Fig. 1.* *Elæacrinus obovatus*, large size, lateral view.

Fig. 2. *Elæacrinus obovatus*, smaller size, anal side.



Fig. 3. cross-section of the hydrospires of *Elæacrinus obovatus* Barris. Enlarged two diameters.

Body obovate or elongate-balloon shaped, more than once and a half as long as wide; upper half wider than the lower, semi-ovoid; greatest width at about two-thirds from the base; lower half gradually increasing in width to the distal end of the ambulacra; base truncate, with a deep concavity, which is filled by the column. Cross-section pentangular, with straight or very slightly convex sides, except along the basals, where the sides are somewhat concave, and the section more stellate.

* At the suggestion of Mr. Charles Wachsmuth, and in conformity with the views of the late Dr. Shumard (Cat. Palaeoz. Foss., in the Trans. St. L. Acad. Sci., 1866, p. 368), I give Roemer's later name, *Elæacrinus*, preference over *Nucleocrinus* Conrad. Conrad's entire description is as follows: "*Nucleocrinus* Conrad. The genus differs from *Pentremites* Say, in having only one perforation, which is central." In this description the only distinguishing characteristic is erroneous, the accompanying figure poor and incorrect, and Hall's excellent descriptions of *Nucleocrinus* were published ten years later than those of *Elæacrinus*. Roemer, in proposing the latter name, gave a good definition of the genus. He found the central aperture, which Conrad had pronounced "the only perforation at the top," closed in perfect specimens, and surrounding it he discovered one large and ten smaller openings.

Basals deeply imbedded within the columnar cavity, the outer angles barely reaching the margin. Radials comparatively small; length twice their width at the basi-radial suture, gradually increasing upward, so that the forks or limbs at their upper side are about equal in width to the body of the plate at its lower side. The lateral sides are somewhat thickened at the upper face of the edge, more particularly toward the lower end of the plate, where they produce indistinct ridges at the suture lines. The upper side of the limbs is gracefully curved in an upward direction, with reëntering angles toward the lateral sutures, and deeper ones toward the radial sinuses. From the bottom of the plate there extends to the radial sinus (which, in this species, is about half-way to the top of the limbs,) a conspicuous rounded ridge, ending in a very prominent lip; and it is this structure mainly which produces the truncation toward the basal region, which otherwise would not be very perceptible.

Interradial or deltoid pieces large, measuring almost four-fifths the length of the body; broad lanceolate. Four of these have a length equal to twice their greatest width. The fifth, that of the posterior side, which in this genus is divided throughout its full length by a large anal plate, occupies, including the latter piece, no greater width than the four regular interradians, and the two halves are narrower at any place than the interposed anal plate. The latter is lanceolate, of nearly equal width throughout, slightly tapering at the upper end. Its lower side rests on the same surface with the other plate, but gradually rises above the general level, and at the top is highly elevated, standing out conspicuously over the adjoining parts. Even in height it extends beyond the limits of the other parts of the body.

Anal aperture large, oval in form, horizontal in position. Toward the outer side, the opening is formed by the wall of the anal plate, which at the upper end is bulging outward without being excavated. The lateral sides of the aperture are formed by the upper curved ends of the interradians, which are connected by two or three small anal vault-pieces, and these constitute the upper boundary of the aperture.

Ambulacra long, narrow, linear, raised above the general level of the body, except close to the oral pole, near which they curve abruptly toward the oral opening, and the ambulacrum becomes located below the abutting surface. The lancet-piece is deeply grooved along the median line, and when the side-pieces (pore-pieces of Roemer) are not in place, there is at the suture, along each side of the plate, a deep sulcus, penetrated by the hydrospire-pores. This sulcus, however,

when the side-pieces are *in situ*, is totally filled, and the sides of the ambulacrum rise abruptly above the abutting edges. The side-pieces rest against the upper face of the deeply crenulated ridges of the lancet-piece. They are strongly wedge-shaped and placed obliquely to the ambulacral or food groove, with the smaller angle directed to the ab-oral side. Their number is from about sixty to nearly ninety in very large specimens. The outer side-pieces (supplementary pore-pieces of Roemer) are comparatively large, their longer side being about two-thirds, their shorter sides fully one-half, of the corresponding sides in the pore-pieces.

The summit is a flat disc, somewhat depressed in the middle, sub-pentangular in outline, the angles resting against the slightly truncated upper part of the oral plates, leaving in the direction of each ambulacrum a good-sized passage. The central aperture is pentangular, rather deeply depressed.

Spiracles ten, one to each side of the ambulacrum; those of the posterior side not in contact with the anal aperture. They are in this species not easily detected, being placed laterally within the projecting edges of the interradians, which for their reception are at this place more prominent, and somewhat excavated. The hydrospires are arranged in ten groups, with two in each group; they are in form similar to those of *Granatocrinus Norwoodi*, but comparatively a little larger. Hydrospire-pores small, and more or less hidden.

Column of medium size, round, composed at the upper end of high joints.

The ornamentation of the radials consists of indistinct concentric curves sub-parallel with the arched upper surface of the plate. The ornamentation of the interradians, as in most species of *Eleacrinus*, is sharply divided by two longitudinal lines, the median part (which in position and somewhat in form, at the four lateral sides of the body, corresponds to the large anal plate of the posterior side) is more or less destitute of ornament. The two sides, however, are crowded with rows of small granules, arranged so as to divide the field into narrow parallel spaces, which are transversely arranged, and of the width of the pore-pieces.

Observations: *Eleacrinus obovatus* differs from *Eleacrinus (Nucleocrinus) angularis* Lyon in the greater length of the body, and in having straight and not concave sides. It resembles, perhaps, closest *Eleacrinus (Nucleocrinus) lucina* Hall, and may be identical with the larger form noticed in the same paper, and which Hall considered a

variety or more adult phase of the above species. Hall describes the latter as more expanded in the upper part of the body, with the base proportionally narrower, and this agrees with our species; but the body is comparatively longer than in Hall's smaller type, while it should, if representing the adult form of the other (according to Wachsmuth, see the preceding paper), on the contrary, be wider and not higher. In *Elæacrinus lucina* the basals are almost on a plane with the radials, and the ambulacra touch the bottom, which is not the case in *E. obovatus*; in the former the lower truncate portions are much wider, and the basals, instead of being deeply concave, are provided with an elongate node in the center.

The above description was made from ten specimens of all sizes; the largest one measuring one inch and three-quarters in length, the smallest seven-eighths of an inch.

Geological position, etc.: Found in the shales of the Hamilton group at Buffalo, in limestone of the same age, at Iowa City, and at the top of the Hamilton group in the Thunder Bay region of Northern Michigan.

The original specimens are in the collection of Mr. Charles Wachsmuth and in my own.

ELÆACRINUS MELONIFORMIS Barris, Nov. sp.

PLATE I.—Fig. 3. Ventral aspect of a specimen.

Body small, ovoid, height nearly one-half more than the width; greatest width through the median part, or a little above; curvature toward the two poles nearly equal, but the pole itself at the abactinal side abruptly depressed, and the concavity perfectly filled by the column. Surface of the ambulacra raised but little above the general plane of the body. The plates along the sides of the ambulacra are marked with obscure transverse grooves, bordered at each side by a sharp ridge, which forms along the median portions of the plate a deltoid-like figure. The ridges which join with one end at the summit, with the other at the radial lips, form together around the body a well-marked penta-petaloid figure, in which the ambulacra are placed along the median line; and as the ridges in this species happen to be more conspicuous than the margins of the ambulacra, the ridges appear as the boundaries of the latter. Cross-section along the upper half of the body obscurely decagonal, almost circular, decidedly pentagonal across the lips of the radials.

Basals small, entirely hidden within the columnar cavity.

Radials small, body-part longer than usual in this genus, their lower portions resting within the concavity, whence they bend abruptly in an opposite direction, forming a sharp edge at the end of the body. Length more than twice the width at the basi-radial suture, which is about equal to the width of a limb at its upper side. Sinus very short, enclosing but little more than the lip, which is strongly protruding, and from which a very prominent rounded ridge proceeds to the lower edge of the plate. The upper sides of the limbs are convex, with a reëntering angle above the lateral sutures.

Interradials large, occupying four-fifths of the length of the entire body, divided by two raised lines into three parts, the inner or deltoid part provided with fine granules, the outer part with transverse grooves, which are equal to the number of side-plates in the ambulacra. The anal plate, which divides the posterior interradial, differs in form but little from the deltoid-shaped portions of the other four interradials; it is, however, a little wider, and at the upper end protruding outward. The anal aperture is large, rhomboidal, the opening in an upward direction. It is bordered toward the peristome by two summit plates, which rest against the upper ends of the two sections of the interradial.

Ambulacra linear, comparatively shorter and probably wider than in any other species of *Eleacrinus*; lancet-piece exposed within the food-groove, but only at the upper end of the plate, its lower half is perfectly covered by the side-plates. There are 36 to 38 side-pieces (outer side-pieces cannot be distinguished in the specimens), with a deep socket to each plate. The hydrosfire-pores are only seen when the side-plates are broken away.

Spiracles ten, one to each side of the ambulacrum; slit-shaped, placed, like those of the preceding species, within the projecting lateral edges of the interradials; those of the anal side non-confluent with the anal aperture. The hydrosfires are unknown.

The summit (which in both type specimens has been preserved) is composed of but few comparatively thick pieces, which are similarly arranged as in *Eleacrinus obovatus*. Column round, central perforation very small.

Observations: This species has its closest affinity with *Eleacrinus* (*Nucleocrinus*) *elegans* Conrad, from which it differs in the more elongate form, in the mode of ornamentation, in having almost straight in place of concave interradial sides, and in the less protruding and comparatively shorter ambulacra. The latter, in Conrad's species, reach to the truncate portion of the body, while in *E. meloniiformis*

they occupy only five-sixths of that length. It differs from *E. Vernucilli* in being a much smaller species, and in the entirely different ornamentation; from *Elæocrinus angularis* Lyon, *E. lucina* Hall, and our *E. obovatus*, as lacking that marked angularity of the body so conspicuous in each of these species. There is a general resemblance to the figure given by Montgomery of *Nucleocrinus Canadensis*, but no direct comparison can be made, as his paper deals in generic rather than specific descriptions. The only specific characteristic clearly brought out, "the prominently arched radials," are totally inapplicable to our species.

Geological position, etc.: In the shales of the Hamilton group, Buffalo, Iowa, and at the top of the same group in the Thunder Bay region of Northern Michigan. The type specimens are in the cabinet of the writer.

PENTREMITIDEA* D'ORBIGNY.

1849. D'Orbigny, *Prodrome de Palæont.*, p. 102.

1853. D'Orbigny, *Cours Élémentaire*, p. 139.

1882. Etheridge and Carpenter, *Ann. and Mag. Nat. Hist.*, p. 220.

PENTREMITIDEA AMERICANA Barris, Nov. Sp.

PLATE I.—*Fig. 4. Pentremitea americana.*

Body small pyriform, height twice the greatest width, which is across the radial lips. Dorsal side in form of a cone with slightly convex sides, triangular at the end, but gradually assuming a strongly marked pentalobate aspect; ventral side of the body equal in length to the dorsal side, curving gently in an upward direction; broadly truncate and somewhat depressed at the oro-anal regions.

Basals forming a triangular vase, with rounded angles, and of a height greater than the width at the top, upper edges slightly concave.

Radials two-thirds the length of the body, a little more sloping than the basals; width at basi-radial suture equal to the width of the plates at the opposite side. The forks occupy two-thirds the length of the plates, are comparatively narrow, and end in a sharp point which con-

*The genus *Pentremitea* differs from *Troostocrinus* Shumard, its nearest allied form, in having quite inconspicuous interradial plates, always placed within the truncate upper face of the body, and only five spiracles, which are strictly interradial, while in *Troostocrinus* the interradials are always visible in a side view of the specimen, and there are ten slit-like spiracles along the lateral edge of the ambulacra, and a separate anal opening. I am indebted to Mr. Wachsmuth for the recognition of the above species as *Pentremitea*, and who claims that it is the first one that has been discovered in America.

stitutes the uppermost part of the entire body. The sides toward the sinus are elevated and formed into sharp edges which stand out at right angles above the ambulacra. Radial lips prominent.

The interradials are not observed in a side view; they are extremely small, and are placed against the tips of two adjoining limbs, within the truncation of the peristome, where they form a narrow rim around the spiracles.

Ambulacra broadly linear, the lateral sides depressed, and forming a deep sulcus; the inner portions almost on a level with the forked plates, except near the mouth, where the whole ambulacrum lies deeper than the surrounding plates.

Spiracles ovate, drawn out in a sharp angle, pointing to and situate close to the mouth. They are placed within the interradial plates, taking up almost their whole surface, leaving exposed a very narrow rim; four of them are equal, the posterior one is larger and confluent with the anal aperture. Hydrospires and summit plates unknown.

The ornamentation consists in fine concentric lines following the general contour of the plates.

Of the two specimens from which this species is described, one is nearly perfect and larger than the other. On one side of the smaller one is a crushed mass of slender arms, composed of pieces of about equal width and height, which possibly may be some of the pinnules.

Pentremitidea americana resembles very closely *Pentremites clavatus* Schultze (*Pentremitidea clavata* Ether. and Carp.), so closely, indeed, that it might almost be taken for it; the latter, however, has comparatively longer basals, is more pentalobate, has wider limbs, with decidedly convex sides in place of almost straight ones, and the ambulacra extend beyond the general surface.

Geological position, etc.: In the upper portion of the Hamilton group in the Thunder Bay region of Northern Michigan. The types are in my own collection.

DESCRIPTION OF A NEW CRINOID FROM THE HAMILTON GROUP OF MICHIGAN.

BY CHARLES WACHSMUTH.

MEGISTOCRINUS CONCAVUS, Nov. Sp.

PLATE I.—*Fig. 5.* Dorsal aspect of a specimen.
Fig. 6. Ventral aspect of another specimen.
Fig. 7. Profile view.

This interesting species represents the most extravagant form of *Megistocrinus* so far discovered. The dorsal side is more depressed than in any other species of this genus; the ventral side highly convex, or subglobose, as high or higher than the dorsal side, slightly bulging posteriorly. Fully one-half of the dorsal side, as far as the third or fourth ring of plates, to the third primary radials, is placed within a deep concavity. In most of the specimens, this whole concavity is covered by matrix, and it appears as if the base were composed of twelve or nineteen pieces, according to whether the second ring only, or the third one also, takes part in the concavity. The upper portions of the dorsal side are spread out almost horizontally, and form a shallow cup, which is covered ventrally by a depressed vault, composed of small irregular plates. The basals and first primary radials, which are arranged almost horizontally, and form the deepest part of the concavity, are scarcely convex at their surface, while all succeeding plates, up to the first secondary radials, inclusively, are extended into a rounded knob. The knobs, which stand out very prominently, cover the entire surface of the plates, and give to the specimen an uncommonly rough appearance. The succeeding plates of the dorsal side, close to the arm bases, and the interradians of the ventral side, are provided at the center with a small tubercle, while the central plate, the proximal pieces, and the principal radial dome-plates are larger and highly convex. Another most remarkable feature is presented by the fact that the third or bifurcating radials are larger than the first and second plates, and that the first secondary radials are frequently the largest plates of the calyx.

Like all species of this genus, *Megistocrinus concavus* has three large basals of equal size; 3x5 primary radials, and the first anal plate is

enclosed within the ring of first radials. It has 2×2 secondary radials, except in the anterior and the left postero-lateral ray, which both, in place of the second plate, have large tertiary radials, and, in place of two, four primary arms.

The interradial plates are disposed in rows of one, two, and three; arranged so as to form three circlelets together with the second and third primary radials and the first secondary ones, respectively. The higher interradials, which are smaller plates, and less prominent than those described, extend to the ventral side, where they meet laterally with similar plates from the axillary spaces, forming jointly with them the greater part of the ventral covering. The azygous interradius is wider, and consists of a larger number of plates, which are generally smaller than their fellows at the four other sides, and their arrangement is less regular. The anus is subcentral, somewhat bulging out toward the posterior side, and extended into a proboscis. The oro-central plate is slightly excentric, and isolated from the proximals by a belt of small pieces. The proximal plates are not connected among each other, nor with the radial dome-plates, which also have a totally isolated position. The arms are unknown.

The column is of medium width, cylindrical; the central canal large, obtusely pentangular, its angles directed interradially.

Locality, position, etc.: The type specimens were collected by Rev. W. H. Barris, of Davenport, from rocks of the age of the Hamilton group, at Alpena, Michigan, and are now in the author's collection.

Remarks: In asking permission of Dr. Barris to describe this remarkable species, it was my wish to draw attention to a very similar form from Sweden, which has been described by Prof. Angelin in the *Iconographia Crinoideorum Suecicæ*, p. 27, and figured there under the name of *Polypeltis granulatus*. The species was referred not only to a separate genus, and separate family, but it has been made the type of a distinct suborder under the name of *Polymera*, for possessing apparently more than five basals.

According to description, the Swedish species is composed of "8 or more basals, 16 parabasals, $10(?) \times 1$ radials"—all axillary—"numerous interradial and axillary pieces," and as having " 10×12 primary arms." It resembles, in general form and in the arrangement of its plates, *Megistocrinus concavus*, and, as in that species, the lower portions of the calyx are concave, but seem to have been obscured in the type specimen. In the American species the concavity includes the two lower primary radials, the lower series of interradials, and the cor-

responding anal plates, there being only 1x5 primary radials exposed along the walls laterally. Had also this ring of plates been included, and none of the lower plates been exposed to view, the formula would resemble that given by Angelin: 1x10 primary radials, and 15 to 16 parabasals, which latter, of course, would be found to represent inter-radial and anal plates. The Swedish species, however, has more arms than the American, and hence higher orders of radials. I feel very certain that *Polypeltes* has 3x5 primary radials, the usual number of basals, and no underbasals, that the wanting plates were covered up in its concave lower part, and that it is identical with *Corymbocrinus*, only representing a more concave form. This is further indicated by the fact that both have the very same arm structure.

The plates, also, of the ventral side, are, from a morphological standpoint, exceedingly interesting. The so-called apical plates are not, as usually, in contact, but are separated by a number of small plates. The belt of pieces surrounding the central one consists of several rows, which increase in number in larger specimens. Similar plates separate the proximals from each other, all occupying an isolated position.

In defining *Acrocrinus Wortheni*, Geol. Rep. of Illinois, Vol. VII., p. 343, with diagram, I described a belt of pieces which, under similar conditions, surround the basals, and asserted that these *abactinal* plates were mutually homologous with the *actinal* pieces surrounding the central plate. A comparison of the diagram of *Acrocrinus* with the figure of the ventral side in *Megistocrinus concavus* will confirm this.

DESCRIPTIONS OF SOME NEW CRINOIDS FROM THE HAMILTON GROUP.

BY W. H. BARRIS.

Presented before the Davenport Academy of Natural Sciences, 1883.

MEGISTOCRINUS NODOSUS. (Revised.)

PLATE I.—*Fig. 8.* A small specimen, showing side and part of dorsal view.

PLATE II.—*Fig. 2.* Ventral view of a larger individual.

This species was originally described from a single very imperfect fragment found in Cook's quarry, near Davenport, and figured in Vol. II. of the Proceedings of the Academy. Subsequent discoveries in the same quarry and in Northern Michigan have added to our previous knowledge sufficient material to warrant a more complete description.

Calyx broadly urn-shaped; the lower truncated part composed of the basals, the first radials, and first anal plate, all nearly in the same plane, the curve rising from the foot of the second radials. Dome composed of numerous small plates, moderately elevated, with marked depressions along the interrarial spaces.

Basals of equal size; sutures indistinct; either scarcely extending beyond the column, or expanding into a hexagonal disc, the periphery of which is slightly thickened.

The first and second primary radials are larger than the third. Secondary radials 2×10 in both antero-lateral rays, which have only two primary arms. The other rays, which have another bifurcation in the calyx, have in place of each second secondary radial, at each side, a tertiary one, and four primary arms. The arms are long, slender, bifurcating, and composed of a double series of interlocking pieces.

Interradials numerous; the first hexagonal, and nearly as large as the first radial. There are two plates in the second, third, and fourth rows, all decreasing in size upward.

The first anal plate resembles the first radials. The second series of anals is composed of three plates, comparatively large, and these are followed by five, and three plates which are more irregularly arranged and smaller.

Dome hemispherical, grooved between the arm bases, and composed of numerous small polygonal pieces, which are interposed among a certain number of much larger and more regular plates. The smaller pieces are at their surface slightly convex, and have a somewhat corrugated appearance; the others are armed each with a strong, short spine.

Central dome-plate nodose or spiniferous; in close contact with the proboscis. It is surrounded by a circle of irregular pieces, comprising several rows. Outside of these pieces there are interradially six larger, very prominent, spiniferous plates, and around these, somewhat closer to the arms, along the median part of each ray, there is another circlet of equally large plates, and also equally spiniferous, which have no connection with the six former ones nor among one another.

Some of the plates in the calyx have a conspicuous central node; the largest one is on the second radial; there is none on the first nor on the basals, but on all plates radial and interradially to the third radials inclusive, sometimes extending until lost on the succeeding smaller plates.

Column stout, round, composed of thicker and thinner joints; canal very large, almost circular.

MEGISTOCRINUS NODOSUS, Var. multidecoratus, Barris.

PLATE II.—*Fig. 3.* Side view of an individual of medium size.
Fig. 4. Ventral view of a smaller individual.

This may be regarded as a variety of the former. While there is the same general arrangement of plates, it is of a more robust make, and attains a greater size. It is mainly distinguishable by the character and extent of its ornamentation. In place of plates having a single protruding central node, they have a series of sharply defined points or slight projections, regularly arranged so as to form noticeable symmetrical and sometimes even grotesque figures on the surface of the plates. Nor is this arrangement confined mainly to the larger plates of the calyx; the higher and smaller plates have also their share of the same kind of ornament.

Whatever may be the character of the decoration on the first radial, it is carried out to its fullest perfection on the second radials and first interradials, less perfectly in each succeeding series of plates.

In the preceding species are transitional forms that seem to look forward to a different mode of ornamentation. In place of a single

node, there are two or three smaller nodes which extend more or less from the first or second radical to the succeeding plates.

Geological position, locality, etc.: The type specimens from which the above description was made were gathered by the writer from rocks of the age of the Hamilton group, at Alpena, in Northern Michigan, and are now in his collection.

DOLATOCRINUS TRIADACTYLUS Barris, Nov. Sp.

PLATE II.—*Fig. 5.* Dorsal view.

Fig. 6. Side and part of dorsal view.

Fig. 7. An individual, showing arms, three to the ray.

Body small, depressed at the dorsal side, slightly elevated at the ventral side; width smaller than the height. Calyx broadly basin-shaped, with a truncation around the base, which includes the whole of the first radials, half of the second radials, and the lower part of the first interradians. Dome in form of a low cone, interradian portions along the sides deeply depressed, the radial region extending outward. There is no appreciable distinction between the anal and interradian series.

Basals three, unequal in size, firmly anchylosed, forming a funnel-shaped concavity for the reception of the column. The first and second radials constitute the bottom part of the calyx, and take little or no part in forming the lateral walls.

The first radials are hexagonal, narrow at the base, the inner margin of which bends slightly into the columnar cavity, its three upper sides somewhat concave. Second radials smaller than the first, quadrangular, broader than high, upper and lower edges straight or convex. Third radial pentagonal, slightly wider and higher than the second; supporting on its upper sloping sides, at one side two radials of the second order, the first large, the second smaller, at the other side 1 x 2 tertiary radials, with one arm at the one side and two at the other, or three arms to the ray, *i. e.*, fifteen in all. These arms are simple, composed of a double series of rather thick, short joints interlocking with each other.

Interradians two; the first one as large as the first radial, sub-ovoid, resting against the curved sides of two first radials, bordered by the second, and reaching nearly up to the height of the third. Supported on its upper curved side is the second interradian, which is smaller and quadrangular. There are two or three small plates above, between the arm bases.

Vault around the oral pole composed of comparatively large plates, ornamented with large granules or irregular nodes. Central dome-plate nodose; proximal plates of larger size and more nodose. The principal radial dome-plates are strongly nodose; they connect with several smaller ones, which together form a kind of triangular elevation toward the arm bases. Anal aperture sub-central, extended into a proboscis which consists of a slender tube of rather thick plates. Column round, composed of equal joints, thickened in the middle, thinned at the outer edges. Central canal round.

The surface markings are by ridges of uniform strength throughout. At the base of the calyx they form a pentagon, the angles of which rest just above the center of the first radial. From this point they traverse the center of each plate in the radial series, forming with the side of the pentagon a large hexagonal figure, the most noticeable feature in this species. They connect in single or double lines the center of each radial with the center of the figure, which is also the center of the first interrarial. From a small cup at this point two or three parallel ridges pass through the second interrarial.

Geological position, locality, etc.: Associated with the preceding species, this was obtained by the writer from rocks of the age of the Hamilton group, in the neighborhood of Alpena, in Northern Michigan, the type specimens being in his collection.

STEREOCRINUS Barris. (*Revised.*)

BY W. H. BARRIS.

1878. Proc. Dav. Acad. Nat. Sci., Vol. II., p. 282.

1881. Revision of the Palaeocrinoidea by Messrs. Wachsmuth and Springer, Part II., p. 126, where it is classified as a *sub-genus* of *Dolatocrinus* Lyon.

The most apparent distinction between *Dolatocrinus* and *Stereocrinus* is the existence in the former of three radial plates to the ray, while in the latter there are but two.

Body variable in form and size; calyx either broad, shallow, or basin-shaped, the bottom comprising the basal disc, together with the first radials, the greater part of the second radials and first interradials, in the same horizontal plane; sides short, abrupt; dome low; or the greater part of the second radials, and the whole of the first interradials, rise into and form the sides of the calyx, which curve gradually; dome low, yet increasing somewhat in height with the height of the calyx. Interradial portions depressed, deepening toward the arm-bases, thus giving the radial portions of the vault a prominent position, enhanced, in this genus, by conspicuously projecting arm-bases. Ventral aspect pentalobate. Basals three, small, nearly equal, closely anchylosed, forming a shallow, funnel-shaped disc, which is pentagonal, and scarcely extends beyond the column.

Primary radials 2x5, the first hexagonal, the second pentagonal, supporting on each of its upper sloping sides two radials of the second order, the upper one serving as a brachial plate. This gives two arms to the ray, making ten in all. These bifurcate, and are composed of a double series of small joints, interlocking with each other.

Interradials two, large, with several smaller ones above, the two forming in series of one each. The first is most generally the largest plate in the body, heptagonal, resting between the two upper sloping lateral sides of the two adjacent first radials, having on either side, above these, the second radial and the first secondary radial. It supports on its upper truncated side the second large interradial, which is hexagonal, and almost of the size of the second radials. The succeeding order of interradials is generally composed of three small irregular plates, reaching up into the depression of the dome, and actually forming part of it. Anal series undistinguishable from the interradial series.

Vault around the pole consists of a moderate number of medium-sized plates, among which the apical dome-plates are well developed, and readily recognized by their large size. Anal aperture sub-central, prolonged into a proboscis, consisting of thick small plates. Column round, having the appearance of alternately thick and thin plates, but really of the same size, and much depressed at the line of juncture; central canal large, pentalobate.

Observations: In the Proceedings of the Davenport Acad. Nat. Sci., Vol. II., p. 282, the author described two species of *Stereocrinus*, accompanied with appropriate illustrations. Attention was then given solely to specific differences, and no attempt was made in the way of generic description, other than the enunciation of the most meagre formula. It is to remedy such defect that the above generic description is given.

A large number of specimens which had been gathered from the Davenport locality, and a still larger collection subsequently made from Alpena, Michigan, were sent to Mr. Charles Wachsmuth, of Burlington, Iowa, who, after careful examination, defined the status of *Stereocrinus* as a *sub-genus* of *Dolatocrinus*, and thus announced it in Part II. of his great work on the Revision of the Palæocrinoidea.

The *range* of this genus, as far as known, seems restricted to the Hamilton of Iowa and Michigan. In the course of his studies, Mr. Wachsmuth had occasion to examine the most extensive collections of *Dolatocrinus* from the celebrated Beargrass locality of Kentucky, among which he failed to find a single specimen of *Stereocrinus*.

Subsequently the entire collection of the Blastoids and Crinoids of the geological survey of Canada passed through his hands for examination and identification. He writes that while there were several new species of *Dolatocrinus*, there were none of the species described in this paper, nor was there a trace of *Stereocrinus*.

Local peculiarities, such as differences in form and size, characterize this crinoid in each locality where it is found. In the quarries west of Davenport, the prevailing form is cup-shaped, with moderately broad base, high curved sides, and prominent dome. In addition, it attains a notably large size, in this respect rivalling the *Megistocrinus*, with which it is associated. These characteristics are well brought out in the illustrations accompanying the original descriptions.*

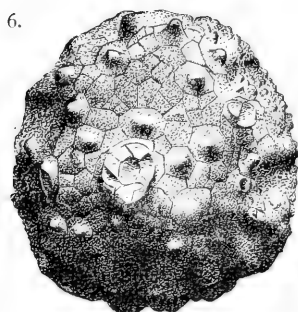
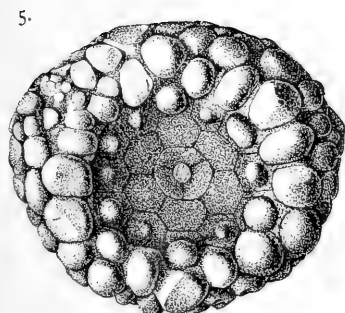
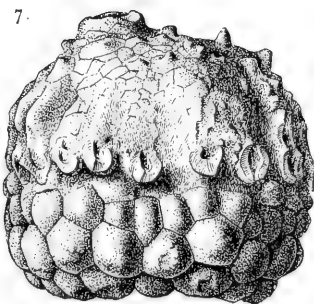
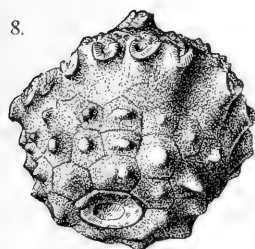
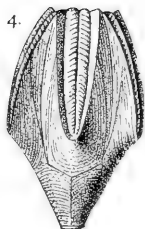
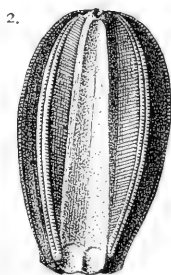
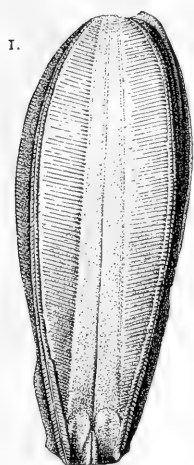
*See Proc. Dav. Acad. Nat. Sci., Vol. II., plate 11.

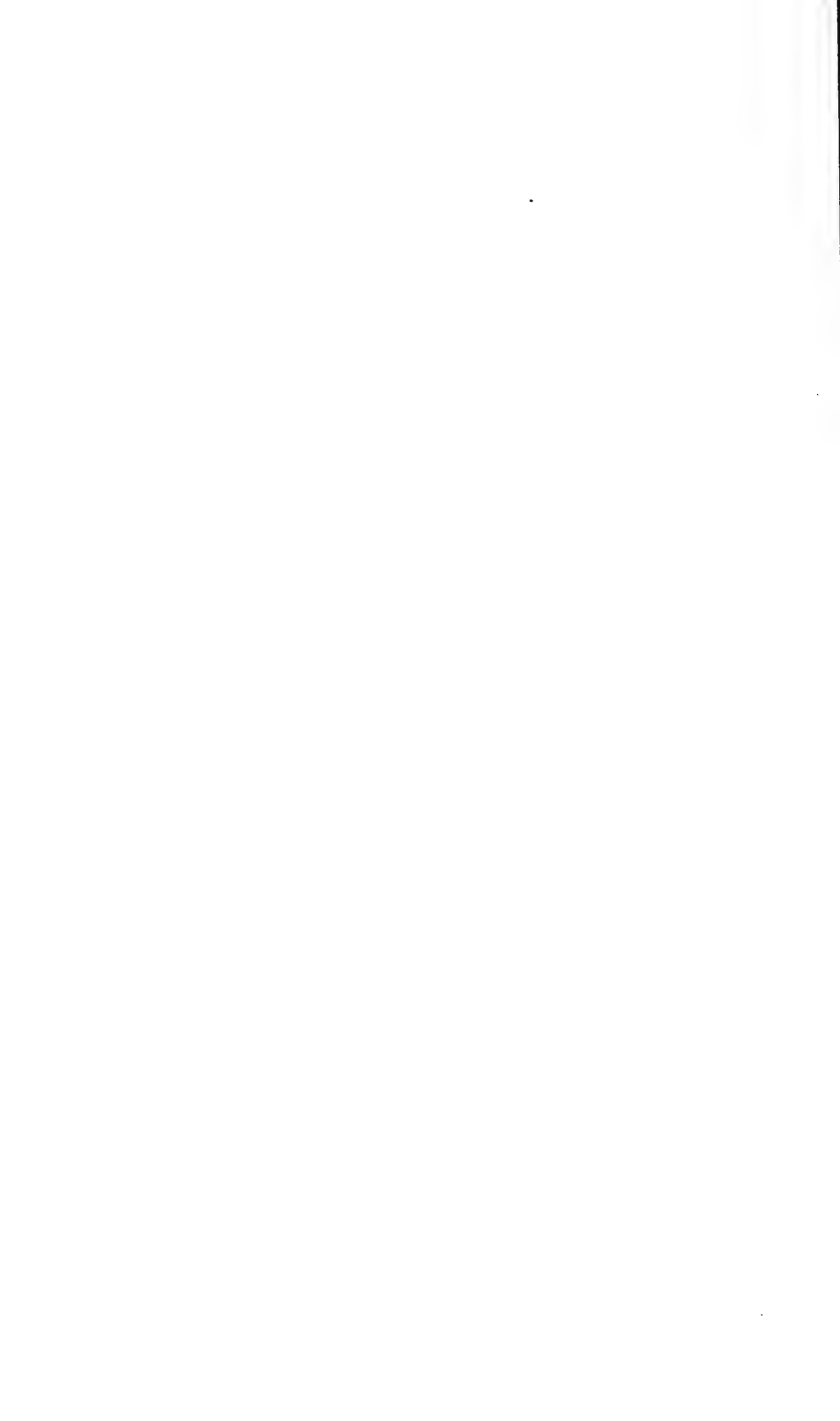
In the neighborhood of Alpena, Michigan, occur two forms equally prevalent. One retains the relative proportions of the Davenport crinoid, but differs from it in scarcely ever attaining one-third of its size. The other is basin-shaped, with broader base than the preceding, steep, low walls, and correspondingly low dome. This seems to have had no representative in the Davenport locality. Such variations, while of interest as exhibiting the result of differing environments and geologic time, do not warrant specific distinctions and description.

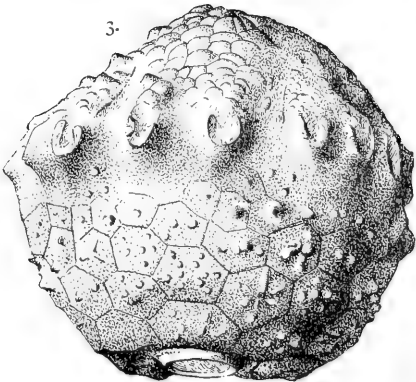
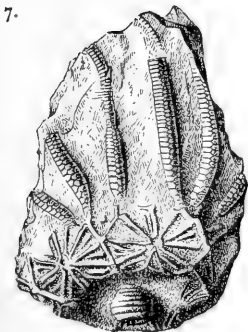
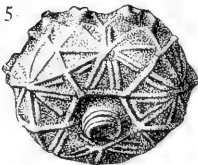
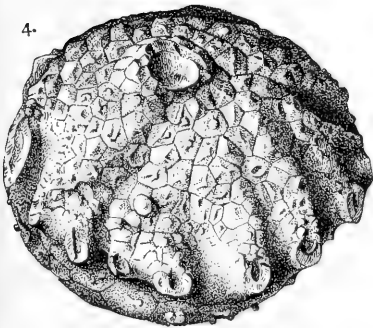
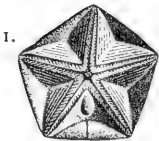
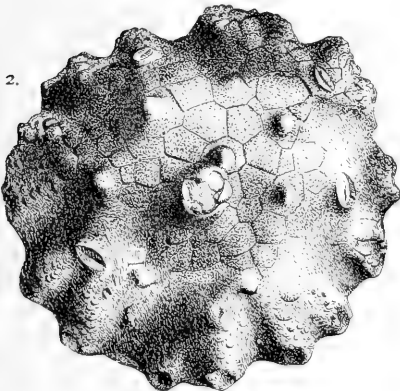
The *condition and character of the deposits* in the two localities are not without interest. In the quarries near Davenport, at least in those portions to which the crinoids are restricted, we find thick, heavy beds of rough, compact limestone, without any partings of shale. While fragments of crinoids abound, yet in most instances they are partially imbedded in the rock, and cannot be extricated without danger of breakage. Everything of present environment suggests conditions most unfavorable to their perfect preservation. On the other hand, in Alpena, Michigan, we find a series of thin bedded limestones, and interlaminated beds of soft argillo-calcareous shales, in both of which crinoids are found, and from which they may for the most part be readily detached. The surroundings indicate a condition of things favorable to their existence when living or their preservation when dead.

The two localities are further distinguished by their *relative place in the series* of which they form subordinate parts. Near Davenport these crinoid-bearing beds lie beneath the shales and shaly limestones that go to make up the series—at the very base of the Hamilton group, *if not below it*. It is claimed by Prof. Rominger, of the Geological Survey of Michigan, that the crinoid-bearing rocks near Alpena head the series—crown the very summit of the Hamilton.*

*See Geology of Michigan, Vol. III., Chap. VI.







Remarks on Aboriginal Art in California and Queen Charlotte's Island.

BY W. J. HOFFMAN, M. D.

Having occasion to again visit the Pacific coast, during the the summer and autumn of the year 1884, for the purpose of continuing research in primitive art, linguistics, etc., it was my good fortune to find a number of localities of great interest, on account of both painted and etched records, made by Indians belonging to tribes which are at this time unknown to us. These records occur in groups; and for the purpose of future reference to them, I shall merely state at this point that the most important series is in the vicinity of Santa Barbara; another, of less extent, near San Gabriel; and the third, consisting of etched characters only, though in great numbers, is in Owen's Valley, west and south of Benton; all of these are in the State of California. I shall first describe the more important series at Santa Barbara.

Immediately north of this delightful place is the Santa Ynez range of mountains, running almost due east and west, north of which are the San Rafael Mountains, running parallel with the former, and beyond these, again, is the Coast Range, which at the same time forms the southern and southwestern boundary of the Tulare Valley. All of these mountain ranges are extremely difficult to cross, excepting at a few points where the Indians formerly had trails for going to and from the coast both for trading and horse-stealing.

The best preserved painted record is located near the summit of the Santa Ynez range, about thirteen miles west of Santa Barbara. This is known as *La Piedra Pintada*. The paintings are in a cavity which measures about twenty feet wide and eight feet high, being narrower at the mouth than in the interior. This cavity is under an immense rock projecting from a ridge into a narrower mountain cañon, near which is a spring of fine water. The rock consists of gray sandstone, but the ceiling and back portion of the cave has a yellowish appearance, is disintegrating, and part of the record is

entirely destroyed. Plate I, A, forms the left-hand portion of the record, and Plate I, B, the right, the missing portion having occupied the middle third of the whole group of paintings. The colors employed were red ochre, white, and bluish-black. At the time of my visit I was struck by the marked resemblance to some of the characters found in Arizona, which are known to have been made by the Moki Indians, but no information could be gained as to the import of the record until I subsequently found at Los Angeles what I consider a hint which may lead to a partial interpretation.

I was informed by the Hon. A. F. Coronel that when he arrived at Los Angeles in 1843 he frequently saw Indians come into town from the north, bringing coarse blankets for sale, which were made of the hair of animals, and colored black and white in alternate, broad, transverse bands. I also found, in Mr. Coronel's collection, small figures of Mexican manufacture representing native costumes and trades, one of which was in imitation of a man lying upon an outspread blanket, which was similar in coloration and arrangement of stripes to the figure shown in Plate III, A, 2, and B, 1, 2. In the same collection, also, are a number of large colored plates of Mexican costumes of former times, and in several of these are serapes, having colors and borders almost identical with those presented in Plate III, A, 2, and B, 1, 2.

The figure in Plate III, B, 1, is evidently a personage of some importance, shown by the lines drawn from the head,* as this method of denoting superiority, condition, or intelligence is almost an universal one. These figures are drawn over or in front of the blanket, as if the latter were intended as a body blanket or serape. The circles with borders, Plate IV, B, 8, 9, 10, in this connection, seem to indicate bales of blankets, the intersecting lines upon both colored and plain circles possibly denoting cords, as wrapped about goods of this kind. This belief is further strengthened from the fact that in Plate III, B, 6 we see the drawing of a man, with head ornaments and breech-cloth plainly visible, leading a horse up hill, upon whose back is apparently a similarly tied bundle, at the right hand of which the ends of the cords are seen projecting. It

* In Plate III, B, 2 is a similar figure mounted upon legs, as if some one were carrying it upon his back, the long arm terminating in a hand directed in an upward direction, possibly so placed to indicate the direction to be taken by the bearer, *i. e.*, upward toward the near summit; as in the same group, Figs. 4 and 20, the arms of the human form are likewise pointed upward.

is probable that the gaudily-colored blankets, if they be such, excited the admiration of the native artist and prompted him to reproduce them, as goods with which he may have been familiar or which were not specially attractive, would be drawn only in simple outline, as in Plate III, B, 5, 6, 19, 21. When we take into consideration the union of the figure of the human being, in Plate III, A, 2, and the circle, A, 1, it may seem as if the idea was to indicate the owner or seller of the goods; in other words, the trader. Fig. 16 in Plate III, B, represents a centipede.

The Indians still living in the vicinity of Santa Barbara disclaim all knowledge of the authorship of these paintings. As before stated, many of the characters are similar to, and some identical with, those made by the Moki and other tribes of the Shoshonian linguistic stock. There is no historic evidence of any tribe of that stock having occupied this immediate vicinity or that north of the mountains. The nearest are the Kautvuya, usually divided into the Serranos or *mountain men*, and the Playsanos or *lowlanders*, who occupied the country south of the San Fernando range, along the coast to a short distance above San Diego, thence eastward across the State to the Colorado river. The tribe now living north of Santa Barbara county is the Tejon, or, as they term themselves, the Tin'liu. This tribe is of the Yokut family and entirely distinct from the preceding.

The tribe who came to trade, and to steal, is said to have come from the north, and according to the characters shown in the pictures the expeditions were made since the establishment of the Mission in 1786, and possibly in the early part of the present century. To reach the immediate vicinity of Santa Barbara from the north only four trails are known, and to three of these I have found rocks with painted figures of various kinds, some of which are almost exact reproductions. The two beside the locality above mentioned are a short distance from the foot-hills four miles northeast of Santa Barbara, where the trail should be taken to make the ascent. One of these is an isolated boulder, on the west side of which are human figures, drawn in the attitude of indicating *self* and *direction*, the extended arm pointing toward another large, isolated boulder on a direct line to the mountain trail. See Plate IV, B, 2.

Fifteen miles west of Santa Barbara, near the San Marcos Pass, and on the northern summit of the range, are a group of paintings

which are unintelligible. These consist of zigzag lines, heavy curved lines serrated on the concave side, figures of the sun, short vertical strokes, etc., as shown in Plate IV, A.

There are temporary streams near by, and springs of water at greater distance, and from the fact that upon a low, flat boulder of granite there are twenty-three mortar holes, it is probable that the people who made these paintings also made the mortars for grinding grass and other seeds, making special visits to this place for the latter purpose at a certain season of each year.

Three miles west northwest of the last-named locality, down in the valley, are indistinct traces of figures painted in red ochre; and six miles farther west, near the ruins of the Mission of San Marcos, is a boulder in the river bottom, upon which apparently similar designs are perceptible, though too much worn to permit copying.

Forty-three miles west of Santa Barbara, in the Najowe Valley, is another rocky promontory, at the base of which are a number of paintings of various grotesque forms of the human body. There are several characters which indicate that the record was painted within historic times, as the figure of an ox appears on the left margin of the principal paintings and at a short distance from them. The human figures, in several instances, appear to be drawn in the attitude of making gestures, similar to that for *surprise* or *astonishment* in Plate IV, A, 2 and 5, and *negation* in A, 4. Many of the characters, though distinct at certain portions, are much worn in other parts, owing to disintegration of the surface upon which they were depicted.

I was deprived the opportunity of visiting an important locality in the Cuyama Valley, on account of the severe and protracted rains, which set in early in the season. This is to be regretted, as the drawings there represented differ considerably from those before mentioned, but closely resemble parts of the interesting series of paintings at Tule Indian Agency, about one hundred and eighty miles to the northeast, which were visited in 1882 and again in 1884.* The general type, of what may be termed the Shoshonian, prevails in all of these records to greater or less degree, and it would be of the utmost interest and importance to make thorough examinations of all of the records known throughout these mountain regions, from Santa Barbara northward, to ascertain, if possible,

* See Trans. Anthropol. Society of Washington, II, 1883, p. 128, *et seq.*, Fig. 1.

how far similar specific types extend, thus gaining a knowledge of the former geographic distribution of certain tribes, if not of certain linguistic families represented by tribes, which are not known, either historically or traditionally, to have lived there.

The second series visited is located in the Azuza cañon, about thirty miles northeast of Los Angeles. After following up the rocky and tortuous cañon of the Azuza, or San Gabriel, river for a distance of ten miles, a side cañon turns off toward the left, which, if followed for about half a mile, will bring us to a white granitic boulder in the bottom of the valley, upon the eastern side of which are the faint yellow outlines of the characters represented in Plate V, A. The left arm of figure 3 is directed toward the northeast, but on account of the precipitous walls of the cañon, egress in that direction is impossible. Two hundred yards farther on, however, the cañon makes a sharp turn toward the northeast, and in rounding the point of land to the right, another boulder, measuring about twenty feet in length and six or eight feet high, is visible immediately below the trail. Upon this are numerous faint drawings of various kinds, the most important of which are shown in Plate V, B, C. This rock is on the line of an old trail leading from the country of the Chemehuevi, on the north of the mountains, down to the valley settlements of San Gabriel and Los Angeles. Any attempt to follow the cañon would have been an extremely rough journey, as well as a considerable increase in distance. The illustrations in Plate V, B, 4, 5, 6, are taken from the northwest side of the rock, so that the extended arms of the human figures are directed toward the passes, above and below, through which the trail could be followed. Fig. 5 appears to point up stream with his right arm, and also shows elevation with the leg of the same side, while with the other arm, the gestures shown seem to indicate a *downward* direction, possibly to denote the lower country of the San Gabriel Valley. Fig. 4, in pointing to the top of a serrated figure, may possibly have some reference to the rocky or hilly nature of the course to be pursued. Fig. 6, and from 7-10, are shown in this connection on account of their general resemblance to those drawn by the Moki. As the Chemehuevi Indians formerly visited the new settlements, it is more than probable that they were the authors of the drawings, which were placed there as a guide or notification of direction to traveling parties. Furthermore, the Chemehuevi Indians are one of the tribes com-

posing the Shoshonian linguistic family, which may be another reason for the similarity of many of the characters to others found in regions occupied by nearly all the remaining tribes of that family. In B, Fig. 5, 6, and C, 8, 9, 10, the hands and feet are identical with Moki drawings, extending even to the projection or caudal extremity, signifying a *male* among the latter. The peculiarity of three-toed and three-fingered feet and hands survives on the Santa Barbara rock paintings shown in Plate III, B, 3, 5, 7, Plate IV, 1, 2, and Plate III, 2, 5, and occurs also in other parts of the world. The peculiarly-drawn human figures in Plate V, 7, of the Azusa series also greatly resembles that at Santa Barbara, in Plate IV, 3, the arms in the latter seeming to point both directions of the practicable trail, while the legs are extended obliquely *up hill* and *down hill*, which exactly corresponds to the topography of the region encountered in going, respectively, north and south.

The third series to which I desire to call attention is that found in the northern portion of Owens Valley, California, between the White Mountains on the east and the Benton Range on the west. The country was traversed by me in 1871 while in command of a side party of the United States Geographical Survey, under the command of Lieut. (now Captain) Wheeler, U. S. A. I saw one group of this series, but being pressed for time, was unable to obtain sketches or to make satisfactory examination of the characters. These are all pecked into the smooth surfaces of rocks of vesicular basalt to the depth of from a quarter of an inch in some specimens to nearly an inch in others. During the past season, however, I went over the region anew, and find what appears to be a series of landmarks to indicate a course to be followed at stated times by Indians in coming up the valley and across the Benton Range to a locality where grass-seed and piñon nuts abound in great quantities. The terminus of the route seems to be at a point four miles southwest from the town of Benton, on the western side of the range. Here are a number of petroglyphs pecked into the rocks around the upper point of a small *mesa*, at the southern base of which are several low, flat boulders, bearing a number of mortar holes for grinding seed. A little farther to the west is a fine spring and a large area of marsh land, on which is an abundance of tall, seed-bearing grass. Immediately to the east of the rock-etchings, and on the slope of the *mesa*, are five or six stone circles, each measuring about eight feet in diameter, which mark the sites of former

temporary lodges. As practiced to-day, when erecting a temporary shelter lodge, stones are placed around the surface required, against which branches of trees and shrubs are placed and interwoven, thus offering some shelter against wind and rain. Amongst these ruins were discovered large quantities of obsidian flakes, arrow-heads, and knives, the exposed surfaces of many pieces having assumed an ashen hue from exposure and weathering.

The southernmost group of etchings is eighteen miles south of Benton; the next group two miles above that, at the Chalk Grade; another, three miles farther north; a fourth, half a mile north of the preceding; then a fifth, which is twelve and a half miles south of Benton and five and a half miles above the first-named. The last-named locality is the one first noticed in 1871, and contains the greatest number of characters. The rocks bearing them trend around toward the northwest, along the faces of which the figures continue, indicating a direction toward a low pass in the Benton Range through which the nearest route is found to reach the old camp above mentioned. The country over which these records are scattered is arid beyond description and destitute of water and vegetation. It is evident that the records were prepared under trying circumstances, and the purpose for which they were placed there was undoubtedly something more than merely to serve as indications of direction.

The Indians, who at present live about the town of Benton, are Pai-Utas, but they are unacquainted with the signification of these characters, and further state that they do not know by whom they were made. Were it not for their superstitious nature, and their suspicions regarding the apparent inquisitiveness of the whites regarding these etchings, some information might possibly be obtained.

After making careful drawings of all the characters which I could find, and which are embraced in the Owen's Valley series, and upon repeated comparisons with those of other localities, at present known to us, within a radius of several hundred miles, I fail to discover any marked specific resemblance, with the exception of those characters representing what appears to be the human form. There are several animal forms, and imprints of the human foot, the tracks of the grizzly bear—specified by large claws,—serpents, zigzag lines, and many anomalous figures. All of these form but a small

percentage of the entire number of etchings. The characters which are greatly in excess, and which present an indefinite variety of form and elaboration, are circles, either plain, nucleated,* bisected, concentric, or "spectacle-shaped," by pairs or threes, or with various forms of interior ornamentation. Plate V, D, E.

This series resembles etchings from the Canary Islands† so closely that the illustrations serve for both localities. The coincidence is remarkable, from the fact that the resemblance does not lie in one or several instances only, but in many. On the same plate, Fig. b, are a variety of circles with ornamented interiors, from a simple bisection to the stellate and cruciform varieties.‡ There are similar ornamented circles, having from three to five short, vertical lines attached to the bottom, B 6, a form of designating water or rain by some Indians; though, if these same characters were shown to some of the Moki or Zuñi Indians, *they* would pronounce them to be masks such as are used in dances and religious ceremonies.§

* In the first volume of the Journal of the Anthropological Institute of New York, 1871-72, p. 65, are two illustrations representing a variety of circles, either plain, nucleated, or concentric, which were copied from a large boulder in Forsyth Co., Georgia, and attributed to the Cherokees. The resemblance between these sculpturings and those from Owens Valley is striking. The spectacle-shaped characters *i. e.* circles united by straight lines, and waving lines terminating in two circles, placed side by side, also occur in both localities mentioned. From information recently obtained, I learn that the Cherokee pictographs in eastern Tennessee are usually placed upon the vertical walls of rock and indicate burial places near by, or caves in which bodies had been interred.

† Noticias sobre Los Caracteres jeroglíficos grabados en las rocas volcanicas de las Islas Canarias; por Mr. Sabin Berthelot. < Boletín de la Sociedad Geográfica de Madrid, 1876, Vol. I, No. 3, pp. 261-279. Map, bearing illustrations of engraved characters. This was also published in Bull. Soc. de Géog. de France, 1875, 6th ser., IX, pp. 177-192, Ill.

‡ Similar circles bearing cross lines are mentioned by Prof. J. Y. Simpson as occurring at Grevinge, Zeeland, and other forms resembling some in Owens Valley, from Sleive-na-Calligha, and, New Grange and Dowth, Ireland. < Proc. Society of Antiquaries of Scotland, 1867. Separate appendix in 4to. Pl. XXXI, Fig. 3; Pl. XXVIII; Pl. XXIX, Figg. 8, 9. Compare also Pl. XLIX of Vol. VII for 1866-68, 1870 of same work, with reference to a sculptured stone from Les Grottes de Keroville, Carnac, Brittany. Text on pp. 394, 395.

§ It is not difficult to find certain characters reproduced in various portions of the world, but when the coincidences embrace an unusual number of instances at any given locality, the fact becomes one of more than passing interest. Of a variety of sculpturings occurring in Owen's Valley, I find exact reproductions of

Near the site of the former camping ground, referred to as being four miles southwest of Benton, are quite a number of characters similar to that shown in Plate V, G, 1, being of a horse-shoe form, with a vertical line within. Sometimes there are several vertical lines running parallel to one another, sometimes only one which is attached at the top, and a few examples occur here, but others more plentifully in the other groups of this series, in which the ends of the "horse-shoe" are brought together so as to form a ring.

In Plate V, H, I, are presented a number of variations of the human form, from a simple vertical line, intersected above its middle by a transverse one, to the more complete character, showing the legs and feet, with the arms and hands in the position of making a common gesture for *negation*.* The figure bearing curved lines from the shoulders, upward and inward, slightly resembles one from the painted records at Tule River Agency, Cal., on the western slope of the Sierra Nevada, and distant about one hundred and fifty miles.† Pl. V, I, 5.

It may be well to call attention to the absence of any representations of the human face, apart from the body, in the California petroglyphs. In the painted records it is generally attached to the body, excepting when it is intended to represent the sun, and where there is always more or less external ornamentation to convey the idea of rays of light or heat. In several foreign localities the human face

several from southern Peru, while a few are strikingly similar. The occurrence at both localities, of deer having peculiarly drawn horns, consisting of a long vertical line with horizontal cross-lines, seems to partake rather of a religious or mystic nature, the presence, also of well-defined serpents of peculiar attitude; the circles, to which short vertical lines are attached, and other characters of curious design which are apparently not unintentional, all lend peculiar interest to a more thorough study and comparison of pictographic records occurring on the Pacific coast of America from Oregon to Patagonia. For further information regarding the Peruvian records above mentioned, see Jour. Ethnol. Soc. of London, New Series, Vol. II, p. 271, Pls. xxii, xxiii.

* A human figure, almost identical with some of these, though having the fore-arms pointing upward instead of outward, occurs on a clay vessel of primitive Scandinavian manufacture, and is reproduced in "Influence classique sur le Nord pendant l'Antiquité, par C. Engelhardt. Traduit par E. Beauvois, Copenhagen, 1876, p. 251, Fig. 59. [Reprinted from Mém. Soc. Royale des Antiq. du Nord.]

† Trans. Anthropol. Soc. Washington, II, 1883, p. 130, Fig. 1.

is found to the exclusion of almost everything else. This is particularly the case on the Amazon river in Brazil* and in the Cura-Malal Mountains, Buenos Aires.†

Of the various outlines of the human form presented by Wallace from Brazil, and referred to more recently by Prof. Richard Andree,‡ we find quite a number to be almost identical with etchings from the Owen's Valley series. Such frequent coincidences are of peculiar interest, from the fact that they furnish additional evidence of the independent origin and development of art in widely separated localities and among distinct tribes or peoples.

Reference has already been made to the fact that many of the characters found in the series of petroglyphs from Los Angeles, Santa Barbara, and Owen's Valley, have numerous similarities to etchings and paintings made by tribes of the Shoshonian linguistic family. The resemblances are greatest between the series near Los Angeles and that in the vicinity of Santa Barbara. That there is sufficient resemblance between the drawings of the several tribes of the Shoshonian family so that a record can, in nearly every instance, be indirectly identified as to authorship, holds true not only with this family, but also with others, notably that of the Algonkian, representative tribes of which are scattered over the country from the St. Lawrence river to Wyoming Territory. Rock etchings made by the Blackfeet Indians§ have more similarity to those found at Cunningham Island, Lake Erie,|| and at Dighton Rock, Mass.,¶ than some of the characters on birch-bark made by the Ojibwa,

* A Narrative of Travels on the Amazon and Rio Negro. A. R. Wallace. London, 1853, p. 524.

† La Sierra de Curá-Malal (Currumalan) Informe presentado al Excelentísimo Señor Gobernador de la Provincia de Buenos Aires, Dr. Dardo Rocha. Por el Dr. Eduardo Ladislao Holmberg. Buenos Aires, 1884, 8vo., pp. 46-55, Plate VI, Figs. 1-7; Plate VII, Figs. 1-6.

‡ Ethnographische Parallelen und Vergleiche. Stuttgart, 1878, Plate 3, Fig. 15.

§ Jones' Report upon the Reconnoissance of Northwestern Wyoming, including Yellowstone Park. Washington, 1875, Fig. 50 on p. 268.

|| Schoolcraft, II, 88, Plate 41; also in Parallelen und Vergleiche, Andree, Plate V, Fig. 49.

¶ Compare illustrations in Schoolcraft: Antiquitates Americanæ, Rafn, and illustrations in the forthcoming Third Annual Rep. Bureau of Ethnology, Washington, D. C.

who occupy the country midway between these extremes. Mr. P. W. Sheaffer furnishes some sketches* from the Susquehanna river, near Safe Harbor, Penna, and from Venango county, in the same State, which clearly indicate their Algonkian origin and may be attributed to the Delaware Indians. Typical Algonkian petroglyphs are also found in several other localities in western Pennsylvania and West Virginia, which were probably made by the Delawares and Shawnees, respectively. By means of these typical characters and almost unvarying styles of specific reproduction in various regions, the former geographic distribution of the Algonkian tribes can now be readily traced with considerable accuracy, and the same may be said with regard to the Shoshonian family. Continued research and the collection of etchings and paintings are highly important in the verification of many incomplete data, and for necessary materials with reference to other interesting linguistic groups of Indians.

While in the vicinity of Los Angeles, Cal., a short time since, I secured an interesting specimen of an Indian gravestone bearing incised characters of whales, etc., and with an ornamental border running around the edge of the tablet. The slab of stone is only a portion of the original—which had once served to indicate the resting place of an Indian—but enough remains to convey the probable import of the inscription. The stone measures about six by ten inches in size, varies from five-eighths to one inch in thickness, is rather triangular in form, and consists of a dull reddish-brown

* Hist. Map of Penna., by P. W. Sheaffer. Pub. Fund of the Hist. Soc. of Penna. Philadelphia, 1875.

These characters, or what appear to be the identical ones, were previously described and figured in the Jour. Anthrop. Institute of New York, Vol. I, 1871-72, pp. 66, 67, Figg. 25, 26. They are here located "in the bed of the Susquehanna River, Lancaster Co., Penna., known as the 'Big' and 'Little Indian Rock.' The groups," the author states, "are relatively more widely distributed *laterally* on the rock, than in the cuts, in which, however, they preserve, in other respects, their true relations."

The fact of their inaccurate reproduction may account for the difference of appearance between the two sets of illustrations.

In the same volume are illustrations of sculptured rocks from Belmont Co., Ohio, in imitation of footprints of birds, mammals, and human beings, among which are the outline of a serpent. The general grouping of the sculptured impressions, together with the presence of the snake, shows marked similarity to those occurring twelve miles south of Benton, Cal.

shale. The Indians who occupied the country where the stone was found—near San Pedro—were the Playsanos or *lowlanders*, one of the two geographic divisions of the Kauvuya tribe. They were in the habit of erecting headstones over their dead, and inscribing various characters thereon, but of what nature I could not at this late day ascertain from the Indians themselves, as the custom has been discontinued for quite a number of years.

I am informed, however, that many of the gravestones found at the old burial places in the vicinity of San Pedro and Wilmington were removed, together with other stones and rocks, to be used as ballast by vessels leaving the harbor at the former place. The Indians who formerly dwelt near the seacoast were chiefly employed in fishing, and from the character and position of the several etchings they appear to represent a whale hunt, probably to denote the profession of the deceased to whose memory the tablet had been erected. Similar customs prevail among the southern Innuits of Alaska, and the Ojibwa.* Among the former, the post erected usually bears rude drawings of the animals, weapons, etc., which the deceased was in the habit of hunting and using. This even extended to females, upon whose headstones household utensils and implements were depicted.

Upon Ojibwa gravestones, the totem of the deceased is drawn in an inverted position, with such other mnemonic characters as may serve to inform the observer of the important events in the life of the departed.†

The coast Indians of Los Angeles county, Cal., made annual trips inland to the marshy sources of some of the streams for the purpose of collecting grass seed to make meal. The chief, I am informed, when praying to the "Great Spirit" for future abundant rains and supply, took a mouthful of water and sprayed it toward the four cardinal points. This ceremony was also recorded by

* Similar gravestones with various characters are also reported from Siberia. Strahlenberg. *Das Nord-und Ostliche Theil von Europa und Asia*, u. s. w. Stockholm, 1730. P. 337.

For information relating to custom in southern Europe, see Dr. Moriz Hoernes. paper, "Alte Gräber in Bosnien und der Herzegowina," in *Mittheil. der Anthropol. Gesell. in Wien.*, XIII Band., (Der neuen Folge III Band), 1883, pp. 169-177, Fig. 37-57.

† Schoolcraft, I, 356.

etching the figure of a man with a line drawn from the mouth. I have not been able to obtain records of this kind, but am informed that instances of their discovery are known.

One form of carving characters upon the bark of trees or poles was mentioned by the Hon. A. F. Coronel, of Los Angeles, Cal., whose residence there dates back to 1843. The tattooed marks upon the face of a chief were reproduced upon trees or poles marking the corners or boundaries of his land. These marks were well known to, and recognized by, neighboring chiefs, and no attempts to trespass was made.*

Facial ornamentation, by the application of colors, is still practiced by most of the Indians west of the Mississippi river, but seldom of any special designs or marks, excepting when participating in religious ceremonies or on the war-path. Among many of the tribes there are still numbers of individuals to be found bearing tattoo marks upon the chin, the cheeks, and even upon other parts of the body; but these marks seldom occur in any forms other than narrow lines, excepting among the Haida Indians, of Queen Charlotte's Island, where the practice and art of tattooing has reached the highest degree of development in this country. Tattooing was done by tracing the design in paint made of powdered bituminous coal, charcoal in the same form, and the skin pricked with sharp splinters of bone or the fins of fish. Of late years, however, gunpowder, India ink, vermillion, and steel needles can be procured without difficulty, and these serve to replace the more primitive materials. Suppuration not infrequently follows the operation, and I have examined a number of examples in which the designs are considerably marred by partial obliteration.

The Haidas tattoo upon the back, breast, forearms, thighs, and the legs below the knee. Women submit to the operation as well as men, though to meet a Haida woman in the clothing now adopted, nothing of her highly decorated body would be observed, unless, perhaps, the backs of the hands, and then only upon careful inspection. The characters tattooed upon the breast and back are generally large enough to cover all convenient space between the

* The tattooed designs upon the face of an Australian native are engraved upon the bark of trees near his grave, which serve as an inscribed tombstone, and can readily be recognized by others of the tribe. *Te Ika a Maui*, or New Zealand and its Inhabitants, by Rev. Richard Taylor, Lond., 1870, Pl. facing p. 378.

shoulders and from the neck downward as far as the ribs extend, and upon the back sometimes even farther.

The characters are totemic and represent either animate or mythologic beings. They are usually drawn in outline, with interior decorative lines, sometimes introducing red to form a pleasant contrast. The ceremonies at which tattooing is done are held in the autumn, and extend over a period of several weeks. To complete the designs upon any one person may require his subjection to the operation at several different ceremonies. The figures generally adopted—and I have examined a good many individuals of both sexes—are the thunder-bird, raven, bear, skulpin, squid, etc. Upon the extremities a figure is drawn to extend from near the elbow down to the back of the hand, usually terminating with the head of the bird or animal adopted. Upon the breast and back the figures are frequently double, so that the middle of the sternum and spinal column, form the dividing line from which the symmetrical figures face outward towards either side.*

The Haidas also carve in wood and slate in the form of columns, the latter about twenty-four inches high and the former reaching a height of from ten to fifty feet. These totem posts are often placed before the council-houses, and more frequently before private dwellings. When the posts are the property of some individual, the personal totemic sign is carved at the top. Other animate and grotesque figures follow, in rapid succession, down to the base, so that unless one is familiar with the mythology and folk-lore of the tribe, the subject would be utterly unintelligible. A drawing was made of one post with only seven pronounced carvings, but which related to three distinct myths. The bear, in the act of devouring a hunter or tearing out his heart, is met with on many of the posts, and appears to form an interesting theme for the native artists. The

* Dr. Heinrich Fischer describes a number of stone relics from Costa Rica, several of them consisting of celts, etc., upon which are engraved human forms similar, in almost every peculiarity, to the ruder forms of Haida carving. Upon several of these carvings, the arms are placed horizontally across the front of the body, so that the right hand rests upon the left side, and the left hand upon the right, as if to express "hugging one's self"—contentment. The head gear also presents similar resemblance to characters noticed among the carvings of the Haidas, as well as other peculiarities pertaining to artistic execution, etc. See *Abhandlungen des Naturwissenschaftlichen Vereins zu Bremen*, Band VII, 1881, pp. 153-175. Pll. IX-XI.

story connected with this is as follows: Toivats, an Indian, had occasion to visit the lodge of the King of Bears, but found him absent. The latter's wife, however, was at home, and Toivats made love to her. Upon the return of the Bear, everything seemed to be in confusion. He charged his wife with infidelity, which she denied. The Bear pretended to be satisfied, but his suspicions caused him to watch his wife very closely, and soon found that her visits away from the lodge for wood and water occurred each day at precisely the same hour. Then the Bear tied a magic thread to her dress, and when his wife again left the lodge, he followed the magic thread, and soon came upon his wife, finding her in the arms of Toivats. The Bear was so enraged at this that he tore out the heart of the destroyer of his happiness. This myth, with the corresponding carvings in walrus-ivory, were found also among the Thlinkit, who undoubtedly obtained the story from the Haidas, as well as the design for carving, as is visible in the method of ornamentation peculiar to the Haidas.

Another very common object found carved upon various household vessels, handles of wooden spoons, &c., is the head of a human being in the act of eating a toad, or, as it frequently occurs, the toad placed a short distance below the mouth. This refers to an evil spirit, supposed to live in the wooded country, who has great power of committing evil by means of poison, supposed to be extracted from the toad. It is a difficult matter to get an Indian to acknowledge the common belief in this mythic being, even when aware that the inquirer is in possession of the main facts.

During the time of my investigations in the vicinity of Victoria, B. C., I was told by a former Factor of the Hudson's Bay Company that when he first reached the country occupied by the Haida Indians, he saw no tattooing upon the bodies of the older members of that tribe. This gentleman, who is well known and occupies a prominent position in the affairs of the Canadian Government, furthermore stated that the Haidas had learned the art from natives of some of the South Pacific Islands. His reason was that they traveled great distances in their canoes, and a number of them had been employed in fur hunting for the company, having visited San Francisco Bay, Santa Barbara, and the neighboring islands for otter, and other skins, and that frequently they were taken across to the Hawaiian Islands by the company's vessels, to return again upon the approach of the hunting season. It was suggested that during

these visits they may have gone farther, or come in contact with natives who taught them the art of tattooing, etc., for which this tribe is so well known.*

I present this statement for what it may be worth, though the fact that tattooed Indians were not met with seems rather curious. The general similarity of the extensive tattoo marks and other ornamentation between the natives of the South Pacific and the Haidas, is certainly remarkable, and has been observed by others.†

There is no historic evidence that the former inhabitants of the islands opposite Santa Barbara, viz: Santa Cruz, Santa Rosa, San Miguel, and Anacapa, ever practiced tattooing; but from the discovery of several relics a short time since, I am led to believe that the custom prevailed. In the collection of Mr. C. W. Clarke,‡ of Santa Barbara, I found several specimens of what appeared to be unfinished tubular pipes; that is, round and slightly conical specimens

* There is an old woman still living near Port Townsend, W. T., a member of the Klallam tribe, who states that many years ago she made an overland trip to San Francisco Bay, with other Indians who were in the habit of travelling to that locality at stated times. The accurate description of the physical peculiarities of the intervening country, as given, before the time of permanent settlement by the whites, the hardships endured, and the dangers with which such a journey was accomplished, give the story more than ordinary interest. Judge James G. Swan, of Port Townsend, also possesses facts relative to this subject, which appear indisputable.

† In the *Compte-Rendu de la cinquième session du Congrès International des Américanistes*, Copenhagen for 1883, and published in 1884, I find the following remarks (p. 323) in the discussion of M. Stolpe's paper *Sur l'Art ornementaire des peuples Américains*, viz:

"M. Reiss: Wenn ich von den Beziehungen sprach, welche zwischen der Ornamentik der Haida's und jener der Südseeinsulaner augenscheinlich bestehen, so wollte ich damit in keiner Weise eine Formenidentität feststellen, sondern nur darauf hinweisen, dass wir bald in ganzen Gedankengang, bald in Einzelheiten der Ornamentik merkwürdige Analogien bei diesen räumlich so weit getrennten Völkern finden; Analogien und Aehnlichkeiten, welche volle Beachtung und eingehende Untersuchung verdienen.

"M. Stolpe remarque qu'il est bien regrettable que l'on connaisse si peu l'ornementation des îles orientales de la mer du Sud. Cependant, tenant compte de tout ce qu'on sait de ces îles par les voyages de Cook, ainsi que par des pièces qui se trouvent dans les musées ethnographiques, il ne saurait se ranger à l'avis de M. Reiss que l'art ornementaire, soit pour le caractère, soit pour le contenu, est le même dans les îles du Pacifique que sur la côte nord-ouest de l'Amérique."

‡ A gentleman possessing an excellent collection of antiquities from the islands.

of steatite, about two and a half inches long and one and a half inches in diameter, having a circular opening in the larger end which terminates at a depth of about two inches. Two small perforations occur at opposite sides of the rim, possibly for the attachment of a cord. In one of these specimens is a hard, compact mass of red ochre, from the surface of which protrude two polished bone implements, each less than half an inch long and one-fourth of an inch broad, bearing incised ornamental cross-lines. The owner objected to the removal of these specimens from the solid mass of paint, but subsequently I saw an extremely sharp-pointed piece of bone with a head of similar form and ornamentation, the idea occurred to me that this might readily have been used for puncturing the skin for tattooing. The acute point may have been preserved from decay by having, until recently, been imbedded in a similar ochreous mass, though a great number of bone awls and fish-hooks in my possession are almost as sharp and just as well preserved, yet these were taken from graves where they were undoubtedly more liable to destruction.

I have not met with any attempts at objective drawings or etchings which may be attributed to the Tshuma Indians, who were the former occupants of the islands above mentioned, but ornamentations upon shell and bone beads, soapstone pipes, shell pendants, and other ornaments seem to consist entirely of straight or zigzag lines, cross-lines, circles, etc. Two well-carved stone images of whales are in the collection of Mr. Clarke, each having perforations through a slight projection on the back, as if they were intended to be secured by means of thin cords. Similar designs have been reported from other countries, either as religious emblems or fetishes and I have no doubt that these served for a like purpose.*

* In this connection it may be interesting to compare similar illustrations of bone statuettes obtained by Baron N. A. E. de Nordenskjöld in Siberia. Un chapitre de l'Ethnographie des Tschouktschis, in *Revue d'Ethnographie*. Tome roisième, No. 5, 1884, pp. 402-423. See Fig. 150, 2, and 11.

EXPLANATION OF ILLUSTRATIONS.

PLATE III.

Painted record, 13 miles west of Santa Barbara, Cal. One-fifteenth natural size.

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PLATE IV.

A. Paintings at San Marcos Pass. One-twentieth nat. size.

A, 2, 4, 5. Selected characters from Najowe Valley, 43 miles west of Santa Barbara. One-twentieth nat. size.

B. Painted figures from a boulder, 4 miles N. E. of Santa Barbara. One-twentieth nat. size.

PLATE V.

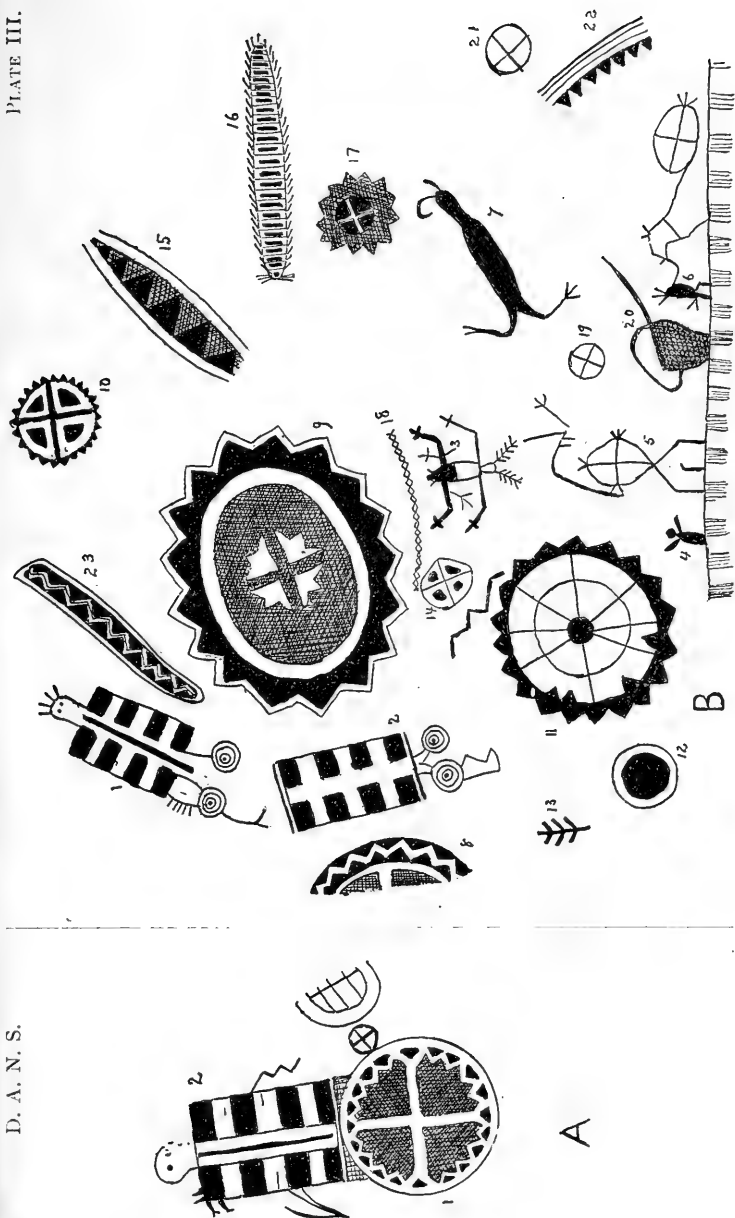
A. From a boulder in Azuza Cañon, 30 miles N. E. of Los Angeles, Cal. One-twentieth nat. size.

B, C. From a boulder near the preceding.

D, E, F, G. Selected characters from rocks in Owen's Valley, Cal.

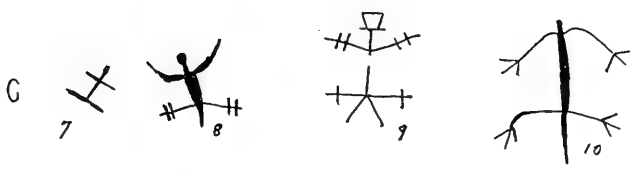
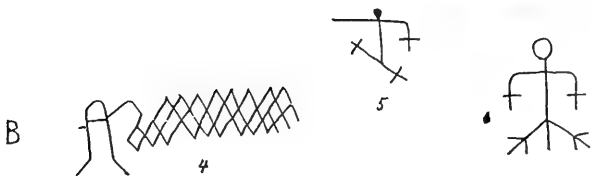
H, I. Varieties of the human form occurring on rocks in the same region.

J. Animal forms from the same locality. All one-twentieth nat. size.











ANCIENT POTTERY OF THE MISSISSIPPI VALLEY.

A Study of the Collection of the Davenport Academy of Sciences.

BY WILLIAM H. HOLMES.

INTRODUCTORY.

For many years the mounds of the Mississippi Valley have been regarded with deep and general interest and scores of writers have hastened to solve the problem of their origin and office, but speculation has so permeated the discussion that the small nucleus of actual knowledge has been overshadowed by errors which have crept, one after another, into literature. Investigation has now reached a point, however, at which a correct solution of many important problems can be looked for with confidence. Science is applying herself earnestly to the work of original research, and at the same time a vigorous onslaught is being made upon the false gods of the theorist. There is still need of much detailed work upon the monuments themselves, and the multitude of works of art deposited in and around them must be studied with the most painstaking care.

Objects of clay are among the most enduring works of men, and their forms and ornaments are of such a character as to afford important keys to the distribution of races and to their accomplishments in the whole circle of the arts—including those even in the most perishable materials. They probably afford a more complete index of the grade of culture reached by prehistoric races than any other class of relics.

Vast numbers of articles of clay have been recovered from the burial places and dwelling sites of the mound-building peoples, and to these it is proposed to devote the following pages. Unfortunately for science, exhumations have generally been carried on in a most unsystematic way, and such small fragments of the collections made as have been preserved in our museums are often without proper record as to locality and mode of occurrence. There are

many specimens in possession of private collectors and obscure institutions, but the body of these ceramic treasures must be looked for upon the shelves of a few great museums. The most important of these are, the National Museum, at Washington; the Peabody Museum, at Cambridge; the Museum of the Academy of Sciences, at Davenport, Iowa, and that of the Academy of Sciences at St. Louis, Missouri.

The most homogeneous and interesting collection of the ancient earthenware of the middle portion of the Mississippi Valley has been made by a handful of enthusiastic devotees of science, at Davenport, Iowa.

These good people have been fortunate in the location of their museum and in the character of the collectors who have chosen to favor them. Captain Hall, the "Old Man of the Skiff," has haunted the banks of the "Father of Waters" for years, and has brought boat load after boat load of curious and interesting relics to this haven at Davenport. The museum of the Academy of Sciences at this place is now a great treasure-house of the art of the ancient inhabitants. I am fortunate in being able to join the people of Davenport in the preparation of a part of this fine collection for publication and in assisting them to give to the world some of the fruits of their long years of toil.

When the final work upon the ceramic art of the mound-building tribes shall come to be written, the series of objects here described will, I doubt not, furnish the material for a most important chapter. It must not be supposed that the resources of this collection are at all exhausted. The study here commenced could be greatly extended. Neither have the labors of the self-sacrificing collectors ceased. They are still going on, and as the years multiply, we shall have the pleasure of seeing the treasures of the Academy increase indefinitely.

I take this opportunity to acknowledge my obligations to my friends in Davenport, especially to Mrs. M. L. D. Putnam and Prof. W. H. Pratt, and to thank them and their associates for most generous and courteous assistance.

CERAMIC GROUPS.

At least three distinct ceramic groups are represented in this collection. These may be distinguished by locality into the Upper Mississippi, the Middle Mississippi, and the Lower Mississippi or Gulf families. Other pottery occurs within the limits of the areas covered by these divisions, but few characteristic examples have come into the possession of the Academy of Sciences. The collection itself shows conclusively that the collectors have seldom wandered beyond the immediate shores of the "Father of Waters."

The three groups enumerated are not equally represented. The great body of the collection is from the middle province. The ware of the Lower Mississippi or Gulf district, of which we have but a small number of pieces, has many features in common with that of the middle district, and at the same time is identical in most respects with the pottery of the Gulf coast to the east. No well-defined line can be drawn between them; but the ware of the north is wholly distinct and need never be confounded with either of the other groups.

MIDDLE MISSISSIPPI PROVINCE.

DISTRIBUTION.—It must not be inferred that there is perfect uniformity in the pottery of this, or any other, extended region; local peculiarities are always to be found. The products of contiguous districts, such, for example, as those of Mississippi county, Arkansas, and New Madrid county, Missouri, have much in common, and will at once be recognized as belonging to the same family, yet the differences are so marked that the unskilled observer could point them out with ease.

As indicated by decided family resemblances the wares of this group extend over the states of Missouri, Arkansas, and Tennessee, cover large portions of the states of Mississippi, Kentucky, and Illinois, and reach somewhat into Iowa, Indiana, Louisiana, and Texas. The types are better marked and the products more abundant about the centre of this area which may be defined roughly as including contiguous parts of Missouri, Arkansas, and Tennessee, with a pretty decided focal center, at least in the abundance of relics, at Pecan Point, Arkansas.

The borders of this district are necessarily not clearly defined. The characters of the art products blend more or less with those of neighboring sections. This is a usual phenomenon and is probably due to a variety of causes. The mere contact of peoples leads to the exchange of ideas, and, consequently, to similarities in the products of industry.

A change of habitat with its consequent change of environment is capable of modifying art to such an extent that certain characters are entirely lost. Groups of relics and remains attributed by archaeologists to distinct stocks of people, may, in extreme cases, be the work of one and the same people executed under the influence of different environments and at widely separated periods of time.

How FOUND.—All peoples have resorted, at some period of their history, to the practice of burying articles of use or value with the dead. It is to this custom that we owe the preservation of so many entire pieces of these fragile utensils. They are exhumed from burial mounds in great numbers, and to an equal extent, perhaps, from simple, unmarked graves which are constantly being brought to light by the plough-share. Fragmentary ware is found also in refuse heaps, on house and village sites, and scattered broadcast over the face of the land. This ware, at its best, has probably not been greatly superior in hardness to the soft pottery of our own furnaces, and the disintegrating agencies of the soil have often reduced it to a very fragile state. Some writer has expressed the belief that a considerable portion of the ware of this province has been sun-baked merely. This view is hardly a safe one, however, as clay, unmixed with lime or other like ingredient, no matter how long exposed, to the rays of the sun, would, from ages of contact with the moist earth, certainly return to its original condition. I have seen but few pieces that, even after the bleaching of centuries, did not show traces of the dark mottlings that result from imperfect firing. There probably was a period of unbaked clay preceding the terra-cotta epoch, but we cannot expect to find definite traces of its existence except, perhaps, in cases where large masses, such as mounds or fortifications, were employed. The relations of the various articles of pottery to the bodies with which they were associated seem to be quite varied. The position of each vessel was determined by its contents or by its real or symbolic use, or, otherwise, by the pleasure of the depositor. With one tribe bottles of water may have been placed by the head and vases of food or

cups of paint by the hands, but with another all may have been placed at the side or by the feet. Uniformity cannot be expected in this more than in other features of burial. In other sections of the country the pieces of pottery were often broken before final inhumation took place, but such was certainly not the practice in this province.

AGE.—There can be no reasonable doubt that the manufacture of this ware began many centuries before the advent of the white race, but it is equally certain that the art was extensively practiced until quite recent times. Pottery was seen in use by the early explorers of Louisiana and the processes of manufacture are described by Dumont and others.

Possibly Du Pratz had in mind some of the identical vessels now upon our museum shelves when he said that "the women make pots of an extraordinary size, jars with a medium sized opening, bowls, two-pint bottles with long necks, pots or jugs for containing bear's oil, which hold as much as forty pints, and finally plates and dishes in the French fashion."*

Vessels were certainly made in great numbers within our period and it is reasonable to suppose that they belonged to the great group under discussion. If not, it will be necessary to seek the cause of their total disappearance, since, as I have already said, the pottery of this district, as shown by the relics, is practically a unit.

The introduction of metal utensils was a death blow to the native industry, although some of the southern tribes seem to have practiced the art continuously, but in a very limited way, down to the present time. There is but little evidence of the influence of the art of the whites upon the ceramic products of this province, although the forms are sometimes suggestive of European models. It is certain, however, that the art had reached its highest stage without the aid of civilized hands, and in the study of its many interesting features we can feel assured that we are dealing with purely aboriginal ideas.

The pottery of this province is of a character so homogeneous that we are warranted in assigning it to a single period of culture, and, in concluding, that the races who developed and practiced the art belonged to a group of closely allied tribes. We can also state without fear of precipitating a controversy that the people who made

* Du Pratz, *Histoire de la Louisiane*, vol. II, p. 179.

this pottery were "mound-builders," but, at the same time, they were not necessarily of the same race or time as the people who built the mounds of other sections, such as Wisconsin, Ohio, or Georgia.

USE.—It is difficult to distinguish the functions of the various forms of vessels. We are safe in stating that in very primitive times nearly all were intended for use in the domestic arts, and that as time went on uses were differentiated—form, as a consequence, undergoing many changes. It is probable that with most peoples particular forms were devoted to especial ceremonial uses. The construction of vases exclusively for mortuary purposes was probably not generally practiced, although a few examples, notably those illustrated in Figs. 14 and 65, point decidedly in this direction.

Only a small percentage of the vessels, and these generally of the pot-shaped variety, show indications of use over fire. Many forms afford no suggestion of their use and in some cases may have been constructed simply to please the fancy.

Lamps, whistles, toys, bricks, tiles, etc., in common use with many barbaric nations, are not found in this province. Pipes so neatly shaped by other mound-building peoples are here of a very rude character.

CONSTRUCTION.—The methods of manufacture have evidently been of a primitive character. The wheel has not been used. At the advent of the whites, the natives were observed to build their vessels by a process known as "coiling," and by modeling over gourds, and over blocks of wood, and masses of indurated clay, shaped for the purpose.

Baskets were also used as moulds, and pliable fabrics, such as nets and coarse cloths, may have been employed, as by the potters of neighboring peoples. The methods of baking have apparently not been described by early writers, but the ware itself bears the marks of those simple processes known to our modern tribes. It is highly probable that the work was done by the women, and that each community had its skilled potters, who built and baked the ware in the open air, going through those simple incantations and mummeries that accompany the work among most primitive peoples.

MATERIAL.—The material employed has usually been a moderately fine grained clay, tempered, in a great majority of cases, if not universally, with pulverized shells. The shells used were doubtless

obtained from the neighboring rivers. Powdered potsherds may also have been added. The clay has, apparently, often been impure or loamy. It was probably, at times, obtained from the alluvial deposits of the bayous—the sediment of overflows—as was the potter's clay of the Nile. The finer processes of powdering and levigation were certainly not known. A slip or wash of very finely comminuted clay is sometimes applied to the surface of the vessel. The walls of the vessels are often thick and uneven, and are always quite porous, a feature of no little importance in the storage of drinking water, but one resulting from accident rather than design.

COLOR.—The paste of this ware presents two marked varieties of color, a dark and a light hue. In a majority of cases it is dark, ranging from a rich black to all shades of brown and gray. The lighter tints are usually warm ochrey grays, rarely approaching reddish or terra-cotta hues. It is highly probable that the differences of color were, to some extent, intentionally produced, and that the material or methods of firing were regulated in a way to produce one tint or another at pleasure. This theory is confirmed by the fact that certain forms of vases are pretty generally dark, while certain other forms are as uniformly light—the latter in nearly all cases being used for the application of color, or of designs in color.

FORM.—This ware exhibits a great variety of forms, many of which are extremely pleasing. In this respect it is far superior to the other prehistoric groups of the eastern United States. The shapes are as varied and elegant as those of the ancient Pueblo pottery, but are inferior to those of Mexico, Central America, and Peru.

As I classify by form farther on, and discuss the origin of form as each form-group is presented, I shall not make further reference to this topic here.

FINISH.—The finish, as compared with the work of civilized nations, is rude. The surface is often simply hand or trowel smoothed. Generally, however, it has been more or less carefully polished by rubbing with a suitable implement of stone, shell, or bone. Nothing resembling a glaze has been found on pieces known to be old. The surface has sometimes been washed or coated with a slip or film of fine clay, which facilitated the polishing, and in very many cases a coat of thick red paint has been applied.

ORNAMENTATION.—The ancient potter of this province has taken especial delight in the embellishment of his wares, and the devices

used are varied and interesting. They include, first, fanciful modifications of form ; second, relief ornament ; third, incised designs ; and, fourth, designs in color.

Modification of form.—It can hardly be claimed that the ancient peoples of this region had a very refined appreciation of elegance of outline, yet the simple, essential forms of cups and pots were, by no means, satisfactory to them. There are many modifications of shape that indicate a taste for, and a constant attempt to realize higher types of beauty. The æsthetic sentiment was considerably developed.

There is also a decided tendency toward the grotesque. To such an extreme have the dictates of fancy, in this respect, been followed, that utility, the true office of the utensil, has often taken a secondary place, although never lost sight of entirely. Bowls have been fashioned into the shapes of birds, fish, and reptiles, and vases and bottles into a multitude of animal and vegetable forms without regard to convenience. All of these modifications of essential forms were doubtless looked upon as, in a sense, ornamental. So far as I can determine they were in no case intended to be humorous.

Relief ornament.—Decorative ideas of a purely conventional character are often worked out in both low and salient relief. This is generally accomplished by the addition of nodes and fillets of clay to the plain surfaces of the vessel. Fillets are applied in various ways over the body, forming horizontal, oblique and vertical bands or ribs. When placed about the rim or base, these fillets are generally indented with the finger or an implement in a way to imitate rudely, a heavy twisted cord—a feature borrowed, doubtless, from basketry. Nodes are likewise attached in various ways to the neck and body of the vessel. In some cases the entire surface of the larger vessels is varied by pinching up small bits of the clay between the nails of the fingers and thumb.

Incised designs.—The æsthetic tendencies of these potters are well shown by their essays in engraving. They worked with points upon both the plastic and the sun-dried clay, as well as at times upon the fire-baked surface. Figures thus produced exhibit a wide range of artistic achievement. They illustrate all stages of progress from the most archaic type of ornament—the use of dots and straight lines—to the most elegant combinations of curves ; and, finally to the delineation of life forms and fanciful conceptions.

Generally, when a blunt implement is employed, the line is produced by a movement that I shall call *trailing*, in contradistinction

to *incision*, in which a sharp point is used, and *excision* or *excavation*, which is more easily accomplished with the end of a hollow reed or bone. *Impressed* or *stamped* ornament is of rare occurrence. The practice of impressing cords and fabrics was common among many of the northern tribes, and nets have been used in the manufacture of vases at many points within this province, but possibly in some cases by exotic peoples. The use of stamps, especially prepared, was in vogue in most of the Gulf states, and to a limited extent in northern localities.

Designs in Color.—The colors used in painting are white, red, brown, and black, and have generally consisted of thick, opaque, clayey paste, white or colored with ochres. Occasionally the colors used seem to have been mere stains. All have been laid on with coarse brushes of hair, feathers, or vegetable fiber. The figures are generally simple and are applied in broad, bold lines, indicative of a strong talent for decoration. The forms are, to a great extent, curvilinear, and embrace meanders, scrolls, circles, and combinations and groupings of curved lines in great variety. Of rectilinear forms, crosses, lozenges, and checkers are best known.

The decided prevalence of curved forms is worthy of remark. With all their fertility of invention the inhabitants of this valley seem never to have achieved the classic rectangular fret or anything more nearly approaching it than the linked scroll or the angular guilloche, while other peoples, such as the Pueblos of the southwest, and the ancient nations of Mexico and Peru found in it a chief resource. The reasons for this, as well as for other peculiarities of the decorative art of the mound-builders as embodied in pottery, must be sought for in the antecedent and coëxistent arts of these tribes.

Origin of Decoration.—Elements of ceramic decoration are derived from both nature and art, and in the primitive stages of culture their originals must be looked for more especially in those articles directly associated with the potter's art. They are acquired from natural objects by contact with the plastic material or by actual copying. They come from accidental suggestions attending manufacture, such as the marks of fingers, implements, and moulds. Decorative motives of these classes are at first, although not necessarily always, non-ideographic. Even those features derived from nature, and imitating natural objects closely, have no significance attached to them, and combinations of, and derivatives from them,

may be non-ideographic. By the processes of convention all classes of delineations may become in time wholly geometric.

Ideographic elements do, however, enter art at a very early stage. Devices at first geometric and non-significant come in time by various methods to have ideas associated with them, still retaining their original forms. Features derived from natural objects, and from pictorial elements may often have a similar history. Again, both mechanical devices and pictorial representations may have ideas associated with them originally, but as a rule these motives are probably later to be absorbed into pure decoration than the simple non-significant devices, as they originate independently of the objects decorated, and are devoted to especial uses. At the same time it must not be assumed that they are really later in origin. The first attempts at delineation are probably ideographic, as in the case of painting and tattooing the face and body, in executing devices of a demonstrative character, such as pictographs, and in the various delineations attending the practice of "medicine" and other mummeries.

If it is true, as already pointed out, that any simple element of design may as time goes on acquire significance, it is also equally true that any one may lose its significance. Neither do elements of decoration retain a uniform expression, they are, especially after having lost their significance, subject to modification by environment, just as are the forms of living organisms. The various agencies of modification are constantly reducing the natural forms to conventional, geometric shapes, and new combinations are forming. The stems or bases of design may be few but the variants are infinite.

All forms of decorative elements, ideographic and non-ideographic, may be in common use by a people at the introduction of the ceramic art. We cannot, therefore, intelligently begin the study of decorative art from ceramic products alone. Even the simplest device thus employed may have an obscure and complicated pre-ceramic history, excepting of course such as can with certainty be traced to the non-ideographic origins referred to in a preceding paragraph. It will readily be seen that we can do little towards deciphering the many geometric devices of prehistoric peoples, and to this class the decoration of the mound-builders is chiefly confined.

There are still many motives clothed in realistic or semi-realistic guises that were evidently significant, and which are rendered more or less intelligible to us by the analogies of historic art. The origin

of decorative ideas, the processes by which they are acquired by the various arts, and their subsequent mutations of form and significance are matters of the greatest interest, but the limit set for this paper forbid their further discussion. A separate paper will be devoted to their consideration.

CLASSIFICATION OF FORMS.—Form cannot be made a satisfactory basis of classification, yet within a given group of products, defined by general characters, a classification by shape will be found to facilitate description. In making such a classification we must distinguish essential from non-essential features, that is to say, for example, that bowls must be placed with bowls, bottles with bottles, etc., disregarding the various fanciful modifications given to rims, necks, and bodies for the sake of embellishment. To recognize these adventitious features, which are almost infinite in variety, would be to greatly embarrass form classification.

There is also another difficulty in the employment of form in classification—the nomenclature is very imperfect. We cannot use Greek names, as our forms correspond in a very few instances only with the highly developed forms known to classic art. Our own plain terms will be far better.

If we take a full set of these primitive vessels and arrange them in the order of increasing complexity we have an unbroken series ranging from the simplest cup to the high-necked bottle with perforated stand or with tripod. A partial series is shown in Fig. 1.

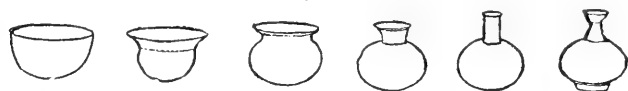


FIG. 1.—Scale of forms.

A multitude of variations from these outlines are found, a few of which are suggested in Fig. 2.



FIG. 2.—Additional forms.

Compound and eccentric forms are given elsewhere.

In deciding upon the order of arrangement for the various form groups I shall be governed by what appears to be the natural order of evolution—a progress from simple to complex. First we have

basin-like vessels, such as *dishes*, *cups*, and *bowls*. Second, vases with wide mouths and somewhat globular bodies, the larger of which would be very generally recognized as *pots*. Third, vases with full bodies and narrow mouths, such as are often termed *jars*, but which are as properly called bottles. Fourth, vessels with high, narrow necks, universally denominated *bottles*. Vessels that cannot be grouped with either of these classes will have to be described in sub-groups, arranged in the order of their complexity or importance.

EVOLUTION OF FORM.—The derivation and subsequent mutations of form will be treated somewhat in detail as the various forms come up. A few general facts and principles may be presented here.

Clay is of such a character that it has no inherent tendency toward especial forms. Being plastic it takes shape from all available models. In the nature of things, these models consist to a great extent of vessels, and of such of these as are in actual use. These vessels are of two classes. They consist of natural and of artificial forms. Natural forms vary with the animal and vegetable products of the country to which the art is indigenous, or in which it is practiced. They include shells of mollusks, shells of fruits, horns of animals, etc.

It is evident that vessels of clay did not come into use until long after artificial vessels in other materials had been produced. These artificial forms have had a decided influence upon ceramic forms. They consist of baskets and nets, and of bark, wood, stone, horn, and tissue vessels. To arrive at absolute originals we must not only trace the form to its immediate, but to its ultimate original which is in nature or in the form necessitated by the inherent character of the material used.

MODIFICATION OF FORM.—Change of form comes about by a multiplicity of means. One important cause is found in the character of the material. Clay has neither the capacity to assume nor to retain the attenuated shapes common to wood, horn, and metal. There are also the incapacity of the modeler, the inadequacy of the method, the demands of multiplying uses, and other potent causes, all of which tend to modify original shapes.

The readiness with which clay assumes new shapes leads to many modifications through simple contact with the forms of other branches of art.

When vessels come within the realm of superstitious usages the forms are subject to new and perplexing influences. Through their dictates certain consecrated forms may be kept for ages at a standstill, while others not so hampered undergo constant mutations.

Later also, when the inventive spirit begins to assert itself more fully, the desire to increase usefulness and to gratify fancy wield a powerful influence toward the modification of outline.

BOWLS.

Basin or bowl-shaped vessels exhibit numberless varieties in shape and style. In size they range from less than one inch in diameter and depth to more than twenty inches in diameter and a foot in depth. In color and finish they are uniform with vessels of the other classes. Their uses were doubtless chiefly domestic.

FORM.—The forms are greatly varied, as will be seen in Figs. 3 and 4. Many are simply segments of spheres and vary from a shallow saucer to a hollow perforated globe. Others have elongated, compressed, or conical bodies, with round or flattened bases. Rect-



FIG. 3.—Forms of Bowls.



FIG. 4.—Forms of Bowls.

angular and irregular forms are sometimes found. Stands and legs are but rarely attached, and handles except of a grotesque character are seldom seen.

ORIGIN OF FORM.—It will probably be safe to assume that some form of shallow vessel—a dish, cup, or bowl, was the first artificial form produced. Such a vessel would be most easily fashioned in clay and may have been suggested by accident, or by natural or artificial vessels as already indicated.

Whatever the origin or whichever the method of construction, the difficulties encountered would at first preclude the manufacture of other than the simplest forms.

ORNAMENT.—The ornamentation of bowls has been accomplished in a variety of ways. These have been already described in a gen-

eral way, under the head of ornamentation. Rim modifications constitute an important feature. The margin or lip may be square, oblique, round, or grooved, as indicated in Fig. 5, *a*, *b*, *c*, and *d*. The scallop may be employed as in *e* and *f*, and relief ornament

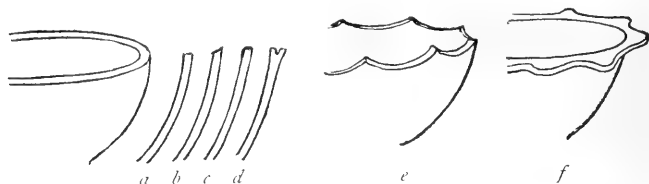


FIG. 5.—Modification of rims.

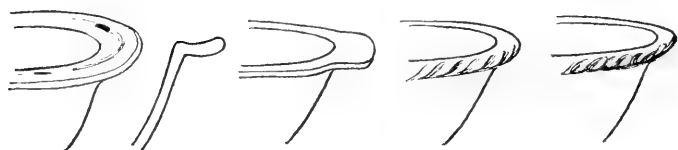


FIG. 6.—Modification of rims.

may be added, such as fillets and nodes and various horizontal projections, as shown in Fig. 6, to say nothing of incised lines and indentations, which are the heritage of wicker-work.

Not satisfied with these simple ideas of decoration the fancy of the potter has led him to add embellishments of most varied and often of extraordinary character. The nodes and ridges have been enlarged and prolonged, and fashioned into a thousand natural and fanciful forms. Shells, fish, birds, beasts, human and impossible creatures have been utilized in a multitude of ways. Many illustrations of these are given on subsequent pages.

The body of the bowl is somewhat less profusely ornamented than the rim. The interior, as well as the exterior, has been treated with both painted and incised designs. In the painted ones the favorite idea for the interior is a series of volutes, in broad lines, radiating from the centre of the basin. Groups of festooned lines either painted or engraved, and arranged to give the effect of imbricate scales, form also a favorite motive. The exterior surface of the incurved rims of globular vessels offers a tempting surface to the artist and is often tastefully decorated.

ILLUSTRATIONS.—*Ordinary forms*.—I have not thought it necessary to present many cuts of simple undecorated vessels, as their

shapes are repeated numberless times in elaborated forms. The crude examples teach nothing as to stage of culture. They are of the same time and people as the finer specimens.

The small bowl given in Fig. 7 is unusually well made, and is peculiar in having its interior surface decorated with a rather chaste incised design consisting of festooned lines. This was a favorite idea with the ancient decorators and may be seen on both exterior and interior surfaces of a variety of vessels. The rim is bevelled on the inner edge and has a beaded or indented fillet encircling the outer margin. The bottom is somewhat flattened.



FIG. 7.—Arkansas.— $\frac{1}{3}$.

ed. This specimen is from Arkansas.

Another rather unusual feature in decoration is seen in a rudely made bowl of medium size. The under surface is entirely covered with a pattern of wide, rough, deeply incised, meandered lines. The rim is abruptly flaring like the brim of a hat. This is ornamented on the rounded margin by a circle of oblique indentations imitating a heavy cord. The paste is much decayed, the numerous large shell particles having been destroyed, perhaps by burning, as the surface shows use over fire.

In Fig. 8 we have a good example of the dark, nicely-finished ware of Arkansas. The widely expanding rim is neatly scalloped on the margin and is finished on the inside with a pattern of incised lines. These lines appear to have been engraved in the hardened clay. The form is rendered graceful by a shallow encircling depression or groove at the base of the rim. The bottom is somewhat flattened.

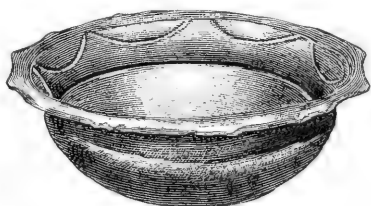


FIG. 8.—Arkansas.— $\frac{1}{3}$.

Occasionally we find very deep bowls with sloping sides and flat bottoms resembling our common flower pots. One example from Arkansas is seven inches in diameter at the top and four at the base, and five inches deep. The rim is peculiar; a heavy band of clay has been added to the outer margin leaving a channel above and beneath. A number of perforations occur in this rim as if made for

the passage of thongs or filaments. A similar specimen of larger dimensions may be seen in the National Museum.

We have a number of bowls with incurved rims. This form is more characteristic of the south and is common along the Gulf coast.

A very small example is shown in Fig. 9. The lower part of the body is nearly hemispherical while the rim contracts slightly, giving a rather graceful outline. The exterior is embellished with a simple figure consisting of four linked scrolls which have been traced with a blunt point in the moist clay.



FIG. 9.— $\frac{1}{4}$.

A much larger vessel resembling the above in shape is given in

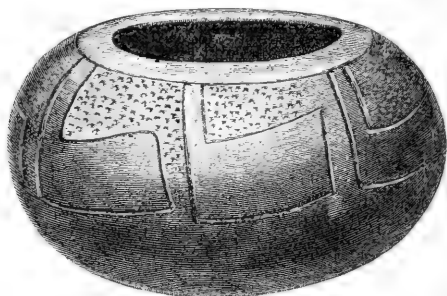


FIG. 10.— $\frac{1}{4}$.

Fig. 10. It is of the dark brownish shell-tempered ware, characteristic of Arkansas. The lip is much incurved and the base considerably flattened, so that the form is that of a greatly compressed oblate spheroid. The outer surface has been moderately well polished, and is ornamented in a very effective manner by a series of figures, outlined by incised lines, alternate spaces being filled in with minute punctures. The figures are combined in a way to suggest a rudimentary form of the fret.

There are many red vessels of the class under consideration, but the majority are less contracted at the apertures and thus approach the pot-shaped variety. They are rather rudely constructed and finished, and but for the color, would seem to be intended for ordinary cooking vessels. I observe in a number of cases that circular medallion-like ornaments have been set around the rim. These are from one-half to one inch in diameter, and are generally perforated or punctured in two or three places, apparently with the idea of

representing a face. The effect is very much like that of the small perforated disks, riveted upon the exterior of copper or tin kettles for the purpose of attaching handles. Occasionally there is a tail-like attachment to the under side of these discoidal heads, suggesting the tad-pole figures upon the sacred water vessels of the Pueblo Indians.

One large basin with slightly incurved rim has a series of triangular figures in red and brown upon both the inner and the outer surfaces. It is rudely finished and of large size, being eleven inches in diameter and seven and a half in height.

Eccentric Forms.—Before proceeding with the discussion of life-forms as exhibited in bowls, I must present a few unique shapes.

These consist of ladle-shaped vessels, and of bowls or basins with rectangular, oval, or unsymmetrical outlines. Ladles are of rare occurrence. In the Third Annual Report of the Bureau of Ethnology I have illustrated the best example that has come to my notice. The Davenport collection contains but one specimen—a rude shallow cup with a short thick handle. The form suggests the wooden and horn spoons of the modern tribes and may have originated in their archaic prototypes.

Fig. 11 illustrates a minute cup rudely made of coarse clay. The outline is oval and slightly pointed at one end as if intended for pouring liquids.



FIG. 11.— $\frac{1}{8}$.



FIG. 12.— $\frac{1}{8}$.

In Fig. 12 we have another very small vessel of rude finish with two pointed lips. A much larger vessel of similar shape may be seen in the collection. The projecting pointed lip is rarely found in aboriginal pottery, although I see no reason why such a feature may not readily have been suggested to the savage by the prolonged margins of his vessels of shell.

Rectangular vessels are of the rude shell-tempered ware and although rare, are widely distributed.

Fig. 13 illustrates a specimen from Pecan Point, Arkansas. The surface is rudely finished and without polish. The color is a dark gray, much flecked with large particles of white shell. Another ex-

ample has a square rim but a rounded bottom, and is covered with a coat or slip of dark red clay.

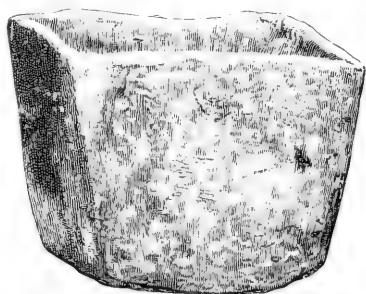


FIG. 13.—Pecan Point, Ark.— $\frac{1}{3}$.

A small vessel from the same region as the preceding has the rim pressed in on the four sides, leaving sharp, projecting corners.

One of the most notable vessels in the collection is illustrated

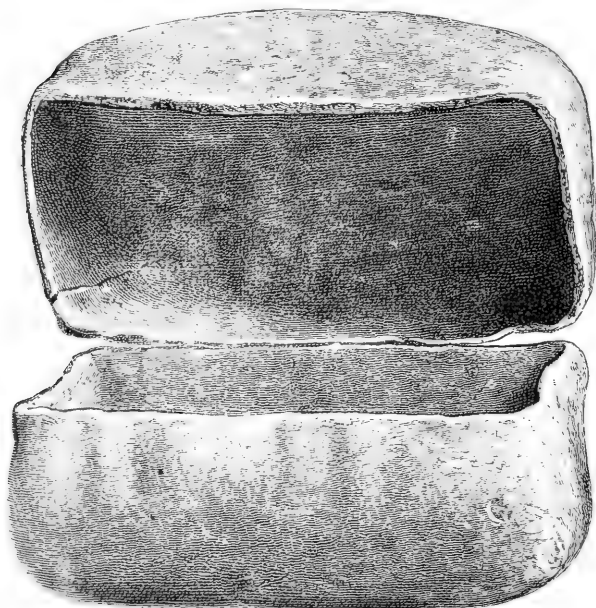


FIG. 14.—Hale's Point, Tennessee.— $\frac{1}{3}$.

in Fig. 14. It is a heavy casket consisting of two parts, body and lid, and is made as usual of clay and coarsely pulverized shell. It

is brownish gray in color and bears some marks of the baking. It was obtained by Captain Hall from a low mound at Hale's Point, Tennessee, and is described by Mr. W. H. Pratt, in the following language: "It is of rude, irregular, quadrangular form, made in two parts. The lower, or case proper, is twelve inches long, seven inches wide, and five inches deep, inside measure, the upper edge being slightly bent inward all around. The upper part or lid is of similar form and dimensions, being very slightly larger, so as to close down over the other part, about one and a half inches, and is somewhat more shallow. As the lid does not fit very perfectly, the joint around the edge had been plastered up with clay. When found, it contained the remains of a very small child reduced to dust, except that some of the bones of the skull, jaws and limbs retained their form, crumbling rapidly, however, upon removal and exposure to the air. There were also found two or three dozen small shell beads. Excepting the remains described, the case was entirely empty. The case weighs six and a quarter, and the lid just six pounds." This is one of the very few vessels that would seem to have been constructed especially for mortuary purposes.

Life forms.—A very large percentage of the bowls of this district are modified in such a way as to resemble, more or less closely, the form of some living creature—bird, beast, or reptile. Especial attention has been given to the heads. These are modeled in the round and attached to the rim or side, while other parts of the animal appear upon different portions of the vessel.

It will be difficult to determine the origin of this curious practice. We shall not be able to say that it came from the elaboration of handles, simply to please fancy, for the reason that vessels of this class are rarely known to have had simple handles; nor from the modification of simple ornaments, as such were but little used. It is still less probable that animal forms were first modeled independently, and afterwards changed in such a way as to serve as vessels. There are no examples of animal forms in clay independently of vessels. It would not be consistent with primitive methods of procedure to copy nature direct, at least until some mystic significance had become attached to the form employed. It is possible, however, that the origin of this practice is not to be found within the plastic art itself, but in the shapes of antecedent and co-existent vessels of other materials in which life forms had been employed; or in the use of

natural objects themselves as utensils, the original forms not having been lost sight of and having in time suggested the employment of other natural forms. Examples of the latter class may be cited.

Shells were primitive vessels. The hard cases of seeds and fruits were also much used. These were doubtless antecedent to vessels of clay. They were the natural models for the potter, the carver in wood or stone, and their employment as such served to lead up gradually to a more realistic and general use of natural shapes in works of art to which they were not essential features. The importance of the various animal forms was doubtless increased by their association with religious ideas. Nearly all the vessels of this class presented in the following illustrations come from the vicinity of Pecan Point, Arkansas.

Shells.—Traces of these antecedent vessels are frequently found in the pottery of our collections. The shells of the sea-shore, and of our large rivers were a common form of primitive bowls. Clay vessels imitating them, are occasionally obtained from the mounds and graves of the Mississippi Valley. The conch shell appears to have been a favorite model, especially in its modified form, Fig.



FIG. 15.—Clay vessels imitating shells.

15, *a* and *b*. The clam shell is also imitated, *c*. These conventionalized forms are exceedingly interesting, as they point out the tendencies and possibilities of modification. Fig. 16, *b*, illustrates an instructive example from this collection. It has four groups of nodes, each consisting of a large central node with four or five

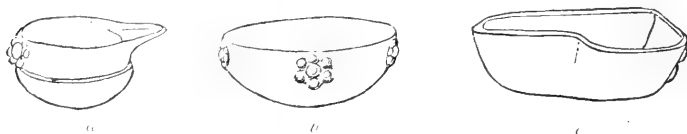


FIG. 16.—Clay vessels imitating shells.

smaller ones surrounding it, set about the rim, the conception being that of four shells joined in one vessel, with the noded apices turned outward, and the bases inward.

A still more highly conventionalized form is shown in *c*. The

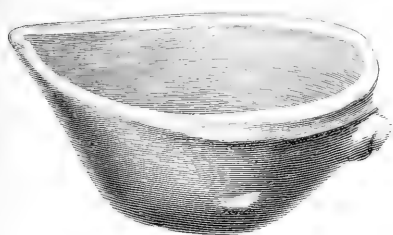


FIG. 17.—Vessel imitating shell.—*d*.

cup is unsymmetrical in outline, and has a few imperfect nodes near one corner, but its resemblance to a shell would hardly be recognized by one unacquainted with more realistic renderings of like subjects. In *a* we have a shell cup placed within a plain cup.

A very good illustration of this class of vessel is given in Fig. 17. It is evidently intended to imitate a trimmed conch shell. The apex and a few of the surrounding nodes are shown at the right, while the base or spine forms a projecting lip at the left.

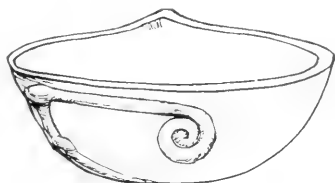


FIG. 18.—Vessel imitating shell.

Fig. 18 shows the end view of the vessel, which corresponds to the top of the shell. A coil of clay forms the apex. This is carried outward in a sinistral spiral to the noded shoulder. We have here a suggestion of the origin of that greatest of decorative motives, the scroll, a clue, however, which the paucity of examples makes it difficult to follow up satisfactorily.

• Although we may not be able to arrive at any definite conclusion in regard to the origin and significance of the practice of modeling life forms in clay, we are certain of one thing, that it became an important feature in the potter's art, and that in due course of time the practice broke loose from the restraints of birth and tradition and asserted its freedom in the production of any form that superstition or fancy happened to dictate.

The artist probably did not follow nature with great accuracy in all the details of species and varieties, but some definite model must, in nearly all cases, have been in view, and such characters as came to be regarded as essential to that creature were never lost sight of, consistency being a most notable characteristic of the art of a savage or barbaric people.

Fish.—The sun-fish has been a favorite model, but its form has generally been employed in vessels with upright necks. A number of examples occur in the next section. The collection contains but two shallow vessels so embellished. These are shown in outline in

Figs. 19 and 20. The first is an oblong, shallow basin of ordinary, gray, shell-tempered clay, and rough finish. The back of the fish is



FIG. 19

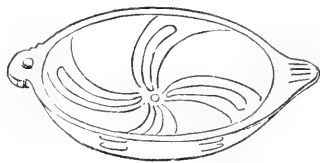


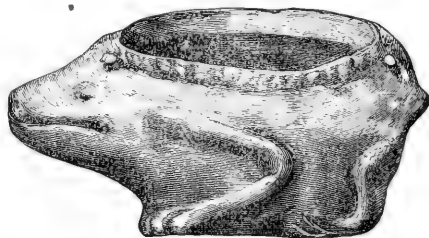
FIG. 20.

Vessels imitating fish.

represented with one long fin, while the belly has three fins, two pectoral and one anal.

The vessel shown in Fig. 20 is finished with an elaborate design in red and white paint. An involute rosette, consisting of broad red and white lines or rays upon a rough, yellowish ground occupies the inner surface. The modeling is quite rude. There are in this case two pairs of fins, the one pectoral and the other ventral.

Frogs.—Of reptilian forms the frog seems to have been the favorite.

FIG. 21.—Craigshead Point, Ark.— $\frac{1}{2}$.

Few examples occur, however, in the shallower vessels. In the bowl

FIG. 22.—Pecan Point, Ark.— $\frac{1}{2}$.

illustrated in Fig. 21, the various members of the body are boldly modeled, and appear about the most expanded portion of the ves-

sel. The rim is ornamented with a series of notches, and two small loops connect the rim with the head and tail of the creature. The legs are characteristic, and the long toes extend beneath the body. The bottom of the vessel is flat. The make and finish are as usual, but the surface has been painted red. A similar vessel is shown in Fig. 22, the view being taken from the front. It is well polished and has a rounded bottom. The color is dark.

Other Forms.—Another interesting example of this use of animal



FIG. 23.—Arkansas.—J.

forms is seen in the vessel presented in Fig. 23. A deep globular bowl of dark, well-polished ware is made to represent the head of an animal. A long snout, with teeth and nostrils and accompanied by a pair of knobs for eyes, embellishes the right side—as seen in

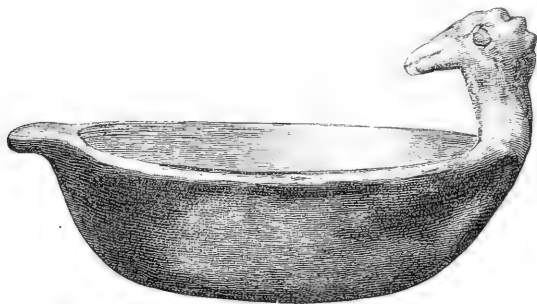


FIG. 24.—Arkansas.—J.

the cut,—ears appear at the front and back, and a circular node standing, perhaps, for the severed neck, is placed at the left. The head has a decidedly porcine look, yet it may have been intended for a raccoon or opossum.

Fig. 24 illustrates a large shallow bowl or pan of ordinary form and finish. The head of a bird resembling a turkey has been at-

tached to one side, with the bill turned inward. On the opposite side there is a small handle like projection that represents the bird's tail.



FIG. 25.—Arkansas.— $\frac{1}{3}$.

A vessel of somewhat extraordinary form is shown in Fig. 25. The bowl is smaller and deeper than the last, and serves as the body of

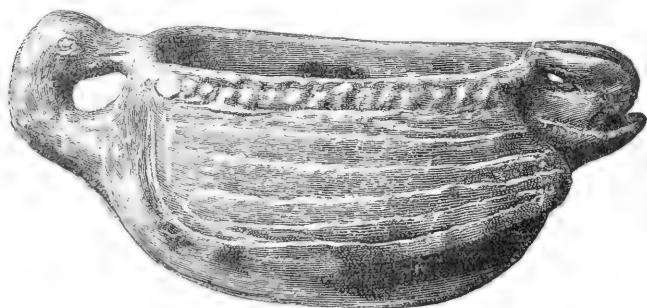


FIG. 26.—Arkansas.— $\frac{1}{3}$.

a bird, the head and tail of which are of unusual proportions. The

neck is very long and thick and is gracefully curved, but the head is not modeled with sufficient care to make apparent the species intended.

The vessel shown in Fig. 26 is also finished in imitation of a bird. In this case the bird is placed upon its back, the neck and head being looped up to form a sort of handle on one side, while the legs answer a like purpose on the opposite side. The wings are represented by a number of lines rudely engraved upon the sides of the vessel. The resemblance of this bowl to the wooden basins made by Northwest Coast Indians is very striking.

The vessel shown in Fig. 27 is probably the most unique in the



FIG. 27.—Arkansas.— $\frac{1}{3}$.

collection. It is a heavy, rather rudely finished bowl, to the rim of which two grotesque heads, apparently of nondescript character, have been attached. One resembles the oft-occurring, plumed serpent of aboriginal American art, in a number of its characters. The other has a double comb resembling somewhat that of a domestic fowl. No description can convey as clear a conception of these monstrosities as the accompanying illustration.

A good degree of skill is shown in the modeling of varieties of birds. A fair idea of the accuracy of these potters in this direction will be conveyed by the series of heads shown in Fig. 28. Several species of ducks are apparently differentiated, one of which, resembling the summer duck closely, is given in *a*, while the head given



FIG. 28.—Heads of birds.

in *c*, although possibly also intended for a duck, is much like a grouse or partridge. The pigeon or dove is seen in *b*, the vulture or eagle in *d*, and the owl in *e*.

It would be difficult to imagine more grotesque and outlandish heads than those attached to the bowls illustrated in Figs. 30 and 31. The vessels themselves are of the usual type, rudely modeled and finished and very heavy. The first is dark in color, the other red. The strange animal here represented is certainly not a close copy of anything in nature. It is characterized by upright ears, a high bulbous snout and a grinning mouth. The teeth in some cases resemble the fangs of a serpent. The eyes consist of rounded nodes; and often curved lines, incised or in relief, extend from them or the mouth down the sides of the neck. The tail at the opposite end of the vessel is turned upward and coiled. The type specimens of this form are from Pecan Point, Arkansas.

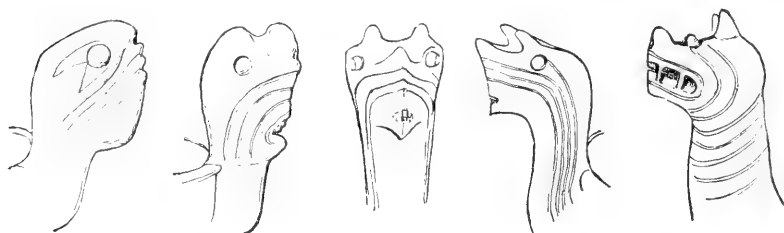


FIG. 29.—Grotesque heads.

The peculiar character of this class of heads is well shown in the series given in Fig. 29. The result of my observations is, that they are possibly attempts to model in clay the mythical plumed



FIG. 30.—Pecan Point, Ark.— $\frac{1}{2}$.

serpent which is so graphically delineated in the engraving upon the little vase shown in Fig. 56. The fact that in one case legs

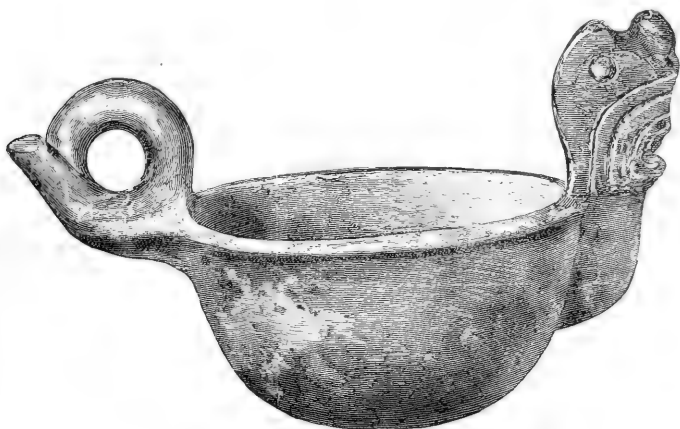


FIG. 31.—Pecan Point, Ark.— $\frac{1}{2}$.

have been added to the base of the body, militates against this theory. Their resemblance to the gargoyle heads of mediæval architecture, suggests the possibility of early European influence.

If possible, a still more novel conceit is embodied in the handle of the vessel shown in Fig. 32. It can be likened to nothing in



FIG. 32.—Scanlon's Landing, Ark.— $\frac{1}{3}$

nature more readily than to the antler of an elk. This vessel is of



FIG. 33.—Arkansas.— $\frac{1}{3}$.

(dark brownish color, and lut slightly polished. A duplicate of

this specimen has recently been added to the National Museum from a grave at Pecan Point.

Similar to the preceding in general appearance are a number of bowls or deep pans, embellished with the heads of animals. A very good example is given in Fig. 33. The head has a decided resemblance to that of a female deer or fawn. The tail appears upon the opposite side of the basin, and is pendant, as in nature. Legs have been added to the base of the bowl; these terminate beneath the body in cloven hoofs.

The small bowl shown in Fig. 34 is nearly hemispherical in shape.



FIG. 34.—Arkansas.— $\frac{1}{3}$.

A small head, representing some animal, has been attached to the rim. The exterior surface is covered with a number of groups of roughly-worked concentric ridges, which may be meant to imitate hair. These ridges have apparently been made by pinching up the clay between the nails of

the fingers and thumb. Figures of similar form are generally incised. This vessel is probably from the vicinity of Pecan Point.

The creature represented by the head shown in Fig. 35, would not be recognized from the cut, or perhaps not even with certainty



FIG. 35.—Pecan Point, Ark.— $\frac{1}{3}$.

from any single specimen, but with a number of examples in view, there need be no hesitation. The animal intended is a bat. In a number of features the likeness is striking. The high top head, the angular ears, and the small eyes crowded down upon the mouth, are

characteristic. The tail is flat, curved a little upward, and ridged along the middle in imitation of the attenuated caudal column. The general consistency of this work is demonstrated by the fact that this particular form of tail accompanies this form of head in all cases, and is not associated with any other. The face of the bat is always turned toward the vessel; on other varieties, it is nearly always turned out.

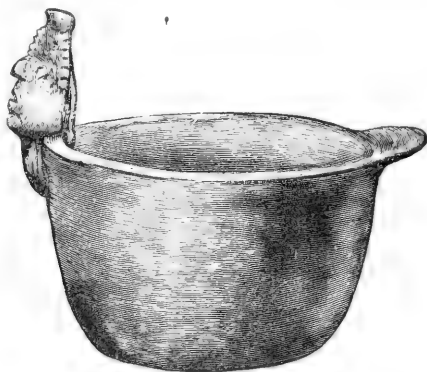


FIG. 36.—Arkansas.—1.

In one case, Fig. 36, we have, what appears to be, a human head attached to the side of the bowl. This head is furnished with a triangular crest, notched on the edges, and enlarged at the top. The case is a perplexing one, especially as a tail like that attached to the bird bowls occurs on the side opposite the head.

POT-SHAPED VESSELS.

There is no hard line of demarkation between the class of vessels now to be considered, and those already described. The distinction is made chiefly for convenience of treatment.

MATERIAL, ETC.—As a rule, pot-shaped vessels are of coarser materials, and of ruder finish than other forms, indicating, perhaps, their exclusive relegation to the culinary arts, where nice finish was not essential. In many cases they show use over fire.

In size, they have a wide range. The larger are often as much as fifteen inches in diameter, and twenty in height. There are a score or more of very large size in the museum.

FORM.—The form characteristics are a full globular body—sometimes elongated, sometimes compressed vertically—a low neck, and a

wide aperture. The bottom is very generally rounded. A few of the form modifications are shown in Fig. 37. The rim or neck is



FIG. 37.—Forms of Pots.

always short, and is upright or slightly recurved. Many vessels resembling the shapes here presented are placed with the succeeding group as they appear to be functionally distinct from this. There are no examples with legs or stands.

HANDLES.—Looped handles are confined almost wholly to this class of vessels. They are generally ranged about the rim or neck. In a majority of cases there are four handles to a vessel. We rarely find less than that number, but often more. It is a usual thing to see fifteen or twenty handles set about the rim. Originally the handles may have been exclusively functional in character, they were so at least in antecedent forms. These potters have certainly, at times, employed them for purposes of embellishment. In some cases they are too fragile for use, in others, they are flattened out against, and united with, the neck of the vessel, throughout their whole length. Again, they have degenerated into mere ridges, notched and otherwise modified to suit the fancy. In many instances, their place is taken by incised lines or indentations which form effective and appropriate ornamental figures. A series of vessels showing gradations from perfect handles to their atrophied representatives is shown in Fig. 38.

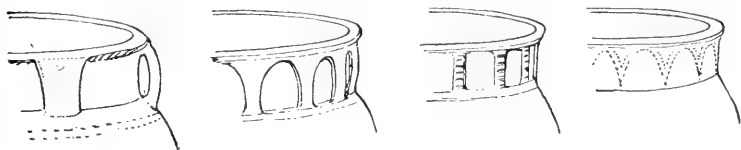


FIG. 38.—Modification of handles.

ORIGIN OF HANDLES.—Handles were doubtless originally attached to facilitate the suspension and handling of vessels and other articles. They probably had their typical development in basketry, and there are good reasons for supposing that certain forms of the handles upon pottery owe their existence to contact with the sister art. This idea is confirmed by their shapes, and by the fact that a large percentage of the pottery handles are useless as aids to suspension or transportation.

ORNAMENTATION.—Rim margins are modified for decorative purposes, very much as they are in bowls. See Figs. 5 and 6.

The bodies of these vessels are often elaborately ornamented, mostly by incised figures, but often by punctures, nodes and ribs. The incised lines are arranged principally in groups of straight lines forming angular figures—a very archaic style—and in groups of festooned lines so placed as to resemble scales. The punctures are made with a sharp point and form encircling lines and various carelessly executed patterns. A rude sort of ornamentation is produced by pinching up the soft clay of the surface between the nails of the fingers and thumb. Relief ornament consists chiefly of applied fillets of clay, arranged to form vertical ribs. Rows of nodes are sometimes seen, and in a few cases the whole body is covered with rude nodes.

ILLUSTRATIONS.—The specimens selected for illustration are intended to epitomize the forms and decorations of a very great number of vessels, and are not always the most showy examples to be found.

A vessel of rather exceptional shape is given in Fig. 39. It could as well be classified with bowls as with pots. The ware is of the



FIG. 39.—1.

rude kind generally used over the fire. The body is high and cylindrical, the rim flaring, and the bottom quite flat. The form is suggestive of our domestic crockery.

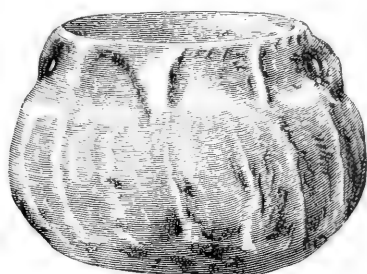
Another bowl-like pot is illustrated in Fig. 40. It is of the dark, rudely hand-polished variety. The body is globular, the neck is very short and is ornamented with a dentate band. Below this are two pairs of perforations, probably used for suspending the vessel. There are a number of vessels of this variety, mostly smaller than the example given.

The vessel shown in Fig. 41 is still more pot-like. The neck is higher than the preceding and is slightly constricted. It is of very rude construction and finish. The rim is furnished with two small

FIG. 40.— $\frac{1}{2}$.FIG. 41.—Waverly, Tenn.— $\frac{1}{2}$.

horizontal projections, and the body is somewhat obscurely lobed. It represents a very numerous class, especially plentiful in South-east Missouri.

The little pot, presented in Fig. 42, has the body covered with rude nodes. The neck is surrounded by a heavy fillet, notched obliquely in imitation of a twisted cord. Four rude handles have also been attached.

FIG. 42.— $\frac{1}{2}$.FIG. 43.—Arkansas.— $\frac{1}{2}$.

In Fig. 43 we have one of the rudest examples in the collection. The neck is furnished with four handles which alternate with four vertical ribs. The body is misshapen and rough, and is ornamented with a series of nearly vertical ridges, a rather usual device, and one which is sometimes very neatly executed.

The body of the nicely finished pot, shown in Fig. 44, is embellished with short, incised markings, arranged in vertical lines. The neck is furnished with a heavy indented band and four strong handles. The locality given is "Four Mile Bayou, Alabama."

The specimen given in Fig. 45 illustrates the use of great numbers of handles. In this case there are sixteen. They are gracefully formed and add much to the appearance of the vessel, which



FIG. 44.—Alabama.— $\frac{1}{3}$.



FIG. 45.— $\frac{1}{3}$.

is really a bowl with wide flaring rim. In most of its characters it resembles the pots.

Another curious variation in the shape of handles is shown in the little cup given in Fig. 46. This can hardly be called a usual feature although occurring in vessels of various localities. I have seen an example from the Missouri Valley in which a great number of perforated handles were set about the rim, and another in which there was a continuous, partially free collar perforated at intervals. There is a specimen of this class in the Davenport Academy collection in which the flattened handles are so placed about the neck as



FIG. 46.— $\frac{1}{3}$.



FIG. 47.— $\frac{1}{3}$.

to form a series of arches. These, I take it, are partially atrophied forms. The body is ornamented by a scale-like pattern of incised lines—a favorite method of decoration with the ancient potter.

In Fig. 47 we have an illustration of total atrophy. The handles are represented by simple incised lines. There is no relief whatever. In many cases the form of the handles is shown in low relief, the outer surface being plain or ornamented with incised lines or

punctures. The body of the vessel last mentioned is covered with rudely incised scroll designs.



FIG. 48.—Pecan Point, Ark.— $\frac{1}{3}$.

Another good illustration of this class of vessel is shown in Fig. 48.



FIG. 49.—Hale's Point, Tenn.— $\frac{1}{3}$.

The cut is taken from my paper in the Third Annual Report of the Bureau of Ethnology. The handles are indicated by incised lines. The body has been ornamented by pinching up the clay between the nails of the thumb and forefinger. Locality, Pecan Point, Arkansas.

A good example of the larger pots is illustrated in Fig. 49. It is engraved a little less than one-fourth the dimensions of the original. The height is 17 inches and the greatest diameter 18 inches. It is very well made. The walls are even and only moderately thick. The dark, unpolished surface is profusely speckled with fragments of white shell. There are four wide, strong handles. The rim and neck are ornamented with encircling lines of finger nail indentations.

A master-piece of this class of work is shown in Fig. 50. It was



FIG. 50.—Pecan Point.—J.

obtained at Pecan Point. This pot is symmetrical in form and very carefully finished. The color is gray with motplings of dark

spots, the result of firing. The height is eleven inches, and the aperture is ten inches in diameter. There are ten strong well-proportioned handles, each having a knob resembling a rivet head, near the upper end. The margin of the rim has a circle of indentations. There are a few red vessels of this shape which have figures of reptiles attached to the neck.

WIDE-MOUTHED BOTTLES OR JARS.

Vessels of this class were probably not devoted to the ordinary uses of cooking and serving food. They are handsome in shape, tasteful in decoration, and generally of small dimensions. They are found, as are all other forms, buried with the dead, placed by the head or feet, or within reach of the hands. Their appearance is not suggestive of their original office, as there is no indication of wear, or of use over fire.

FORMS.—I include, under this head, a series of forms reaching from the wide-mouthed pot to the well developed bottle. They really correspond closely to the high-necked bottles in all respects save in height of neck, and the separation is therefore, for convenience of treatment only. The following illustration, Fig. 51, will give a good idea of the forms included.

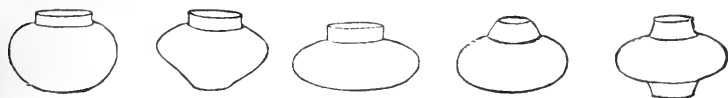


FIG. 51.—Forms of low-necked bottles.

There are also many eccentric, and many extremely interesting life forms included in this group. An extraordinary vase, modelled after a human head, is, by its general outline, properly included.

ORNAMENTATION.—The rims, bodies and bases are embellished much after the fashion of the vessels already described, with the exception that handles, or handle-like appendages or ornaments seldom appear. The painted designs are in one, two, or three colors, and the incised figures have been executed both in the soft and in the thoroughly dried clay.

The style of execution is often of a very high order, especially in some of the more southerly examples, a number of which are from the mounds of Mississippi and Louisiana. We note the fact that in a number of designs there is, to the student of American art, a decided suggestion of Mexican forms.

In illustrating this group, I am compelled, for the want of space to omit many interesting examples. I present only such as seem to me to be especially instructive.

ILLUSTRATIONS.—*Ordinary forms*.—The vessel shown in Fig. 52 may be taken as a type of a very large class. It is most readily described as a short-necked, wide-mouthed bottle. It is sym-



FIG. 52.—Pecan Point, Ark.— $\frac{1}{2}$.

metrical in shape and very nicely finished. The lip is supplied with a narrow, horizontal rim. The body expands somewhat abruptly from the base of the upright neck to the squarish shoulder, and contracts below in an even curve, giving a hemispherical base.



FIG. 53.—Arkansas.— $\frac{1}{2}$.

There are a multitude of variations from this outline, a few of which are suggested in Fig. 51. These vessels are nearly all of the dark, grayish-brown, fire-mottled ware. A few are yellowish, and such are often painted red or decorated with designs in red and white.

Two charming vases are shown in Figs. 53 and 54. The surface finish is in both cases very superior. The lines of the figures are carefully drawn, and seem to have been produced by the trailing, under even pressure of a smooth rather blunt point. It is difficult to get so nicely finished and even a line by simple incision, or by excavating the clay. The design in Fig. 53 consists of eight groups of



FIG. 54.—Arkansas.— $\frac{1}{2}$.

curved lines, arranged in pairs, and separated by plain vertical bands. It might be considered an interrupted and imperfectly connected form of the running scroll. This grouping of lines is frequently met with in the decorative designs of the Southern states. The design upon the other vase, Fig. 54, is still more characteristic

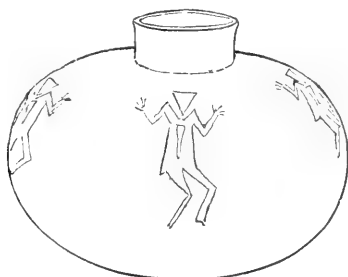


FIG. 55.—Arkansas.

of the south. It consists of three encircling rows of round, shallow indentations, about which series of graceful scrolls are linked.

Many other interesting illustrations of the simpler forms could be given, but nearly all are very similar in their more important features to the examples that precede or follow.

As skillful as these peoples were in modeling life forms, and in engraving geometric devices, they seem rarely to have attempted the linear representation of life forms. We have, however, two very good examples.

The first of these is shown in Fig. 55. It is a large bottle embellished with four very rude drawings of the human figure, executed with a sharp point in the soft clay. Height, eight inches.

The work is characteristic of a very early stage of art. The figures could be duplicated in the work of the ancient Pueblos, and the pictographic art of many of our savage tribes. They are probably derived from symbolic art, and possibly relate to the guardians of the four points of the compass, or to some similar mythical characters.

The work upon the neat little bottle presented in Fig. 56, is of the same class as the above but of a much higher grade, both in execution and conception. The engraved design is one of the most remarkable ever obtained from the mounds. It consists of two winged and crested rattlesnakes, which encircle the most expanded part of the vessel, and of two sunflower-like figures, alternating with

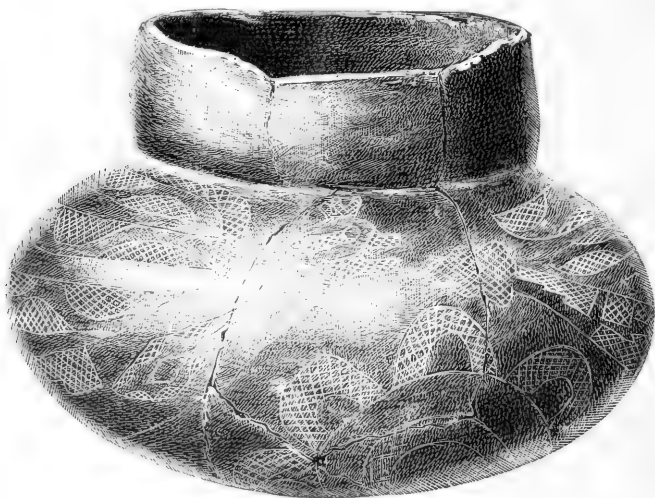


FIG. 56.—Arkansas.—3.

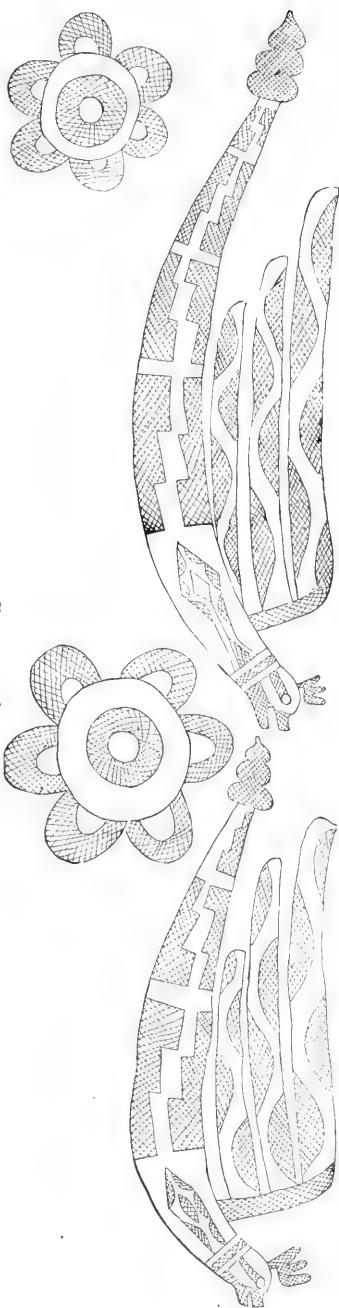
them. These designs are very carefully engraved with a needle-like point, and are adjusted to the form of the vase in a way that suggests forethought and a knowledge the decorative value of the

figures. By dint of rubbings, photographs and sketches, I have obtained the complete drawing of the various figures which are given in Fig. 57, on a scale of one-half the original.

The serpent, especially the rattlesnake, has always taken a leading part in the mythology and the art of the more cultured American races, and crest-plumes, and wings have often been considered its proper attributes. The conventional method of representation is also characteristically aboriginal. The plumes, the figure connected with the eye, the bands upon the neck, the stepped figures of the body, and the semi-circular patches on the wings are all characters that appear again and again in the ancient art of the United States. The peculiar emblematic treatment of the heart is almost universal in temperate North America. And just here I may be permitted to suggest that the remarkable feature of the great earth-work serpent of Adams county, Ohio, which has been regarded as the "symbolic egg," and which in its latest phase has become the issue of a frog and the prey of the serpent, is probably nothing more than the heart of the serpent, the so-called frog being the head.

The rosettes are often seen in Indian art. There can be little doubt that the figures of this design are derived from mythology.

FIG. 57.—1.



Eccentric Forms.—A form of vessel of which civilized men make peculiar use is depicted in Fig. 58. There is a marked resemblance to a common tea-pot. A very few examples have been found, two of which have been engraved for the Third Annual Report of the Bureau of Ethnology. The specimen here given is well made and care-

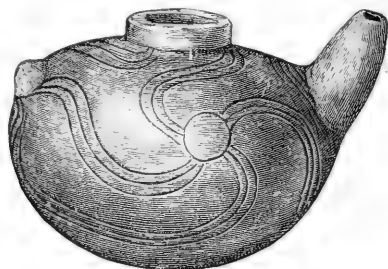


FIG. 58.—Arkansas.— $\frac{1}{2}$.

fully finished. The neck is low and wide, and the body is a compressed sphere. The spout is placed upon one side and a low knob upon the other. The absence of a handle for grasping indicates that the vessel was probably not intended for boiling water. These characters are uniform in all the specimens that have come to my notice.



FIG. 59.—Arkansas.— $\frac{1}{2}$.

Two small circular depressions occur on the sides of the vessel alternating with the spout and knob and with these features form centres for four rosettes of involute incised lines. The origin of this form of vessel is suggested by a fine red piece from "Mississippi," now in the national collection. The knob is the head of a

turtle or other full-bodied reptile, and the spout takes the place of the creature's tail. Many of the animal-shaped vases would resemble this form closely if an opening were made through the top of the body and through the tail.

In connection with the teapot-like vessels it will be well to describe another novel form not wholly unlike them in appearance,



FIG. 60.—Pecan Point, Ark.— $\frac{1}{3}$.

an example being shown to Fig. 59. The shoulder is elongated on opposite sides into two curved, horn-like cones, which give to the body a somewhat crescent-shaped outline. It is of the ordinary plain, dark ware, and has had a low stand or base which is now broken away.

The specimen given in Fig. 60 has been considerably mutilated,



FIG. 61.—Pecan Point, Ark.— $\frac{1}{3}$.

but evidently belongs to the same general class as the preceding. It probably also resembled the vessel which follows; it serves at

least as a link between the two. The body is ornamented with carelessly drawn, deeply incised, involute designs.

Life Forms.—A further elaboration of this feature is illustrated in Fig. 61. On one side the conical projection is greatly elongated and fashioned to resemble the head of some grotesque beast, with horns, expanded nostrils, and grinning mouth. The opposite point is elongated and looped forming a tail, while the base of the body is furnished with four feet. An outline of this strange head has already been given in Fig. 29. On the sides of the vessel are engraved figures, consisting of clusters of involute lines, as in the specimen just given. It is of the ordinary dark pottery, and was obtained at Pecan Point.

Equally noteworthy as plastic representations are the two examples that follow. The vessel shown in Fig. 62 is modeled in imita-

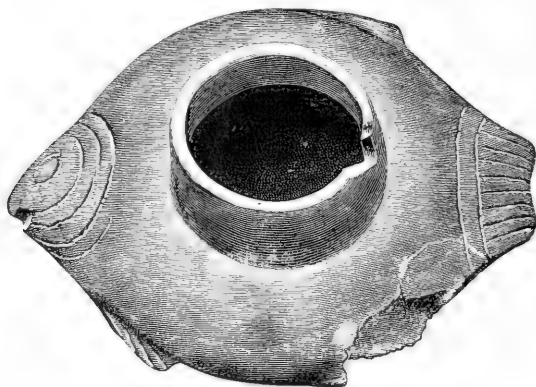


FIG. 62.—Arkansas.— $\frac{1}{2}$.

tion of a sun-fish. The body is round and neatly polished. The head is well modeled as are also the fins and tail. Many examples of this form are found, some of which are elaborately treated, the scales being minutely shown. The body of the fish is sometimes placed in the natural upright position, the neck of the vessel appearing from the back and giving rise to the lenticular shape.

The animal so carefully modeled in the vessel given in Fig. 63 resembles a raccoon or opossum. The mouth of the vessel is wide and the neck upright and short. The body is ornamented with a pattern made up of triangular groups of incised lines, which may or may not be meant for hair.

The love of modeling life forms shows itself again in the little vase illustrated in Fig. 64. The head of some animal, rudely suggested, projects from one side while a curved tail on the other



FIG. 63.— $\frac{1}{2}$.

carries out the idea of the complete creature. The round body is decorated with broad vertical lines in dark red. A red line encircles the rim.

It is not strange that a people who had successfully engaged in the modeling of life forms, and especially the heads of animals,



FIG. 64.— $\frac{1}{2}$.

should attempt the human head. Their remarkable success in this direction is shown in a number of vases, one of which is given in Fig. 65. This and kindred peoples had made considerable progress in carving in stone and other materials, evincing a decided talent for sculpture; but clay is so much more readily manipulated than

either wood, stone, or shell, that we are not surprised to find their best work in that material.

It is an interesting fact that with all this cleverness in the handling of clay, and in the delineation of varied models, the art had not freed itself from the parent stem—the vessel—and launched out into an independent field. In a few cases such an end seems to have been achieved by certain groups of mound builders, notably the case mentioned by Prof. Putnam in the Sixteenth Annual Report of the Peabody Museum. Modeling in clay was probably confined to vessels for the reason that, through their humble agency, the art was developed.

Up to the present time I have met with but six of these curious head-shaped vases. All were obtained from the vicinity of Pecan Point, Arkansas, and have, like other vessels, been associated with human remains in graves or mounds. It is true that in all cases the bones of the dead have not been found, but this only indicates their complete decay. The question as to whether or not these vases were made exclusively for sepulchral purposes must remain unanswered; there is no source of information upon the subject. Such a purpose is, however, suggested in this case by the semblance of death given to the faces. The finest example yet found is shown in Fig. 65.

Form.—In form it is a simple head, five inches in height and five inches wide from ear to ear. The aperture of the vase is in the crown, and is surrounded by a low, upright rim, slightly recurved. The cavity is roughly finished, and follows pretty closely the contour of the exterior surface excepting in projecting features such as the ears, lips, and nose. The walls are generally from one-eighth to one-fourth of an inch in thickness, the base being about three-eighths. The bottom is flat, and takes the level of the chin and jaws.

Material.—The material does not differ from that of other vessels of this locality. There is a large percentage of shell, some particles of which are quite large.

Color and Finish.—The paste is yellowish gray in color and rather coarse in texture. The vase was modelled in the plain clay and permitted to harden before the devices were engraved. After this a thick film of fine yellowish-gray clay was applied to the face, partially filling up the engraved lines. The remainder of the surface, including the lips, received a thick coat of dark red paint. The whole surface was then highly polished.

Features.—The cut will convey a more vivid conception of this striking head than any description that can be given. The face cannot be said to have a single feature strongly characteristic of Indian physiognomy. We have instead the round forehead, the depressed nose, and the projecting mouth of the African. The face would seem to be that of a youngish person, perhaps a female. The other heads differ in many respects from this, only one exhib-



FIG. 65.—Pecan Point, Ark.— $\frac{1}{2}$.

iting a decidedly American type of face. The features are all well modeled, and are so decidedly individual in character that the artist must have had in his mind a pretty definite conception of the face to be produced as well as of the expression appropriate to it, before beginning his work. It is not my impression, however, that the portrait of a particular personage was intended. The closed eyes, the rather sunken nose, and the parted lips, were certainly intended to give the effect of death. The ears are large, correctly placed, and well modeled; they are perforated all along the

margin, thus revealing a practice of the people to whom they referred.

Tattooing.—Probably the most unique feature is the pattern of incised lines that covers the greater part of the face. The lines are deeply engraved and somewhat “scratchey,” and were apparently executed before the slip was applied. The left side of the face is plain, with the exception of a figure somewhat resembling a grappling hook in outline which partially surrounds the eye. The right side is covered with a comb-like pattern placed vertically, with the teeth upwards. The middle of the forehead has a series of vertical lines and a few short horizontal ones just above the root of the nose. There are also three curved lines near the corner of the mouth not shown in the cut.

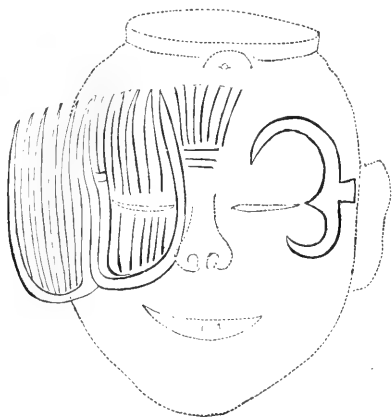


FIG. 66.—The engraved figures.

The diagram presented herewith, Fig. 66, gives in dotted lines the correct outline of the front face, and shows projected in solid lines the engraved figures.

The significance of these markings can only be surmised in the most general way. Their function is probably the same as that of the tattooed and painted figures upon the faces of living people. It will be well to observe that upon the forehead, at the top, there is a small perforated knob or loop. Similar appendages may be seen upon many of the clay human heads from this valley. A Mexican terra-cotta head now in the museum at Mexico has a like feature, and at the same time has closed eyes and an open mouth.

The head dress should be noticed; it seems to have been mod-

eled, after a cloth or skin cap. It extends over the forehead, falls back over the back of the head and terminates in points behind. It is shown in Fig. 67.

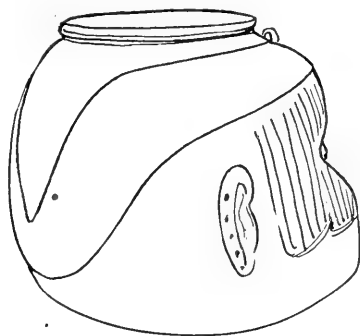


FIG. 67.—Head covering.

Two layers of the material are represented, the one broad, the other narrow and pointed, both being raised a little above the surface upon which they rest. This vase head is somewhat smaller than the average human head.

Another of a very similar character now in the Davenport Museum is about one-half the size of this. The face is much mutilated.

A third is somewhat larger than the one illustrated, but is nearly the same in finish and color. The face also simulates death, but the features are different, possessing very decided Indian characteristics. There is no tattooing.

All of these heads, including also the three in the National Museum, are so alike in conception and execution that they may have been made by the same hand.

HIGH-NECKED BOTTLES.

High-necked, full-bodied bottles form a decided feature in the pottery of this province. Similar vessels are rarely found in other sections of the United States, but occur in Mexico and South America. The forms are nowhere else so pronounced. They suggest the well-known water bottles of eastern countries.

In material, finish and decorative treatment they do not differ greatly from the vases described in the preceding section.

FORM.—Their forms are greatly, and often, happily varied as will be seen from the series of outlines given in Fig. 68.



FIG. 68.—Scale of forms.

A striking feature is found in the presence of legs and stands. The former exhibit globular, conical, cylindrical, and terraced forms, Fig. 69. No example has any striking resemblance to European forms. All are tripods, and are attached to ordinary forms of vessels in a way to suggest that they are superadded features probably rather recently acquired; at the same time legs were doubtless employed by the pre-columbian peoples. This is known to be true of Mexico, and Central and South America. There is no reason why the moundbuilders should not have discovered the use of such a device, readily suggested by the use of supports in building, in baking, or in using the vessels, and it would necessarily follow the modeling of life forms. It is true that quadrupeds would not directly suggest the tripod, but birds modeled in clay were made to rest upon the feet and tail, thus giving three supports; besides it would readily be discovered that more than three supports are unnecessary.



FIG. 69.—Tripods.

The stands attached to these bottles are not essentially different from those described in the preceding section. They take the form of simple bands, as seen at *a*, Fig. 70; double bands, as shown in *b* and *c*; or, perforated feet, as seen in *d*.



FIG. 70.—Stands.

Compound vessels are rather rare, nearly all of the varieties being outlined in Fig. 71. Some of these are formed by uniting two, or

even three, simple forms in one. Others are only partially compound and resemble the askoidal shapes of Greek art. Attention

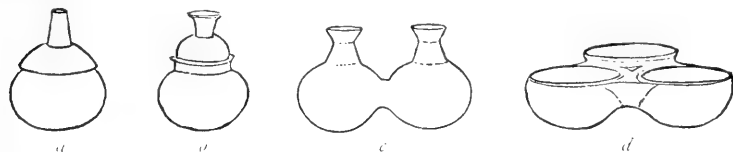


FIG. 71.—Compound forms.

will be called to the probable origin of all of these shapes farther on.

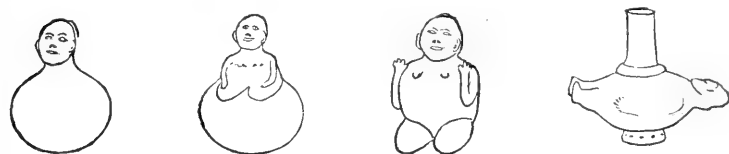


FIG. 72.—Adaptation of the human form.

Life forms are found in all the groups of ware, but differ in the manner in which they are employed. Fig. 72 shows the usual



FIG. 73.—Tennessee.— $\frac{1}{2}$.

methods of adapting the human form to high-necked bottles. Quadrupeds, fishes, and birds are treated in somewhat similar ways.

ORNAMENT.—The styles of decoration are not distinct from those of other classes of vessels. The incised scroll patterns are sometimes very elaborate, and the designs in color are perhaps executed with greater care than in other groups.

ILLUSTRATIONS.—*Ordinary forms.*—I have not thought it advisable to figure many specimens of plain bottles, as all the varieties of outline are repeated in the more highly elaborated or embellished pieces. Fig. 73 represents a plain bottle of the ordinary dark porous ware. The neck is narrow above and expands abruptly below.



FIG. 74.—Arkansas.— $\frac{1}{8}$.

The body is globular. Looking at this vessel with reference to a possible original, we observe its resemblance to a common form of gourd. By a review of the collection, we find that there are a large number of similar vessels actually modeled in imitation of gourds. Good examples are given in the Third Annual Report of the Bureau of Ethnology, from which Fig. 74 is taken, and in a paper by Edward Evers in Contributions to the Archæology of Missouri. The markings of the original are often shown with a great deal of truthfulness.

Quite distinct in outline from the preceding forms is the bottle shown in Fig. 75. The neck is high and cylindrical and the body



FIG. 75.—Arkansas.— $\frac{1}{3}$.

resembles a slightly-flattened globe. Set about the shoulder are



FIG. 76.—Arkansas.— $\frac{1}{3}$.

four medallion like faces, the features being modeled roughly in low relief. The ware is of the ordinary dark slightly polished variety.

We have, in Fig. 76, a good example of bottle shaped vessels, the neck of which is wide and short and the body much compressed vertically. There are a number of duplicates of it in the museum. The specimen illustrated is in the national collection and was obtained in Arkansas. It is a handsome vase, symmetrical in form, quite dark in color, and highly polished. The upper surface of the body is ornamented with a collar formed of a broad fillet of clay, or rather perhaps two fillets, the pointed ends of which unite on opposite sides of the vase.



FIG. 77.—Arkansas.— $\frac{1}{2}$.

Modifications of the simple outline of bottles exhibit many interesting eccentricities.

Compound forms are not unusual and consist generally of imitations of two vessels, the one superimposed upon or set in the mouth of another. A good example in the ordinary plain dark ware is given in Fig. 77. Similar shapes are suggested by lobed forms of the gourd.

Other examples may be seen in which there is only a gentle swelling of the neck, but all gradations occur between this condition and that in which two fully formed vessels appear.

A very usual form is illustrated in Fig. 78. Below the overhanging lip the neck contracts and then expands until quite full, and at the base contracts again. This feature corresponds to the upper vessel

suggested in the preceding case. Four flattened handles are placed



FIG. 78.—Pecan point, Arkansas.— $\frac{1}{3}$.

about the upper part of the neck and three rows of small conical pits encircle the most expanded portion. The body is plain and much



FIG. 79.—Arkansas.— $\frac{1}{3}$.

compressed vertically. A low wide stand is attached to the base.

A number of good examples, now in the National Museum, were found in Arkansas.

The vase shown in Fig. 79 has also the double body, the vessels copied having been somewhat more elaborately modeled than in the preceding cases. A bottle is set within the mouth of a pot. The neck is high, wide, and flaring and rests upon the back of a rudely modeled frog, which lies extended upon the upper surface of the body. The notched encircling ridge beneath the feet of the reptile represents the rim of the lower vessel which is a pot with compressed globular body and short wide neck. This vase is of the dark, dead-surfaced ware and is quite plain. Four vertical ridges



FIG. 80.—Arkansas.— $\frac{1}{2}$.

take the place of handles. I have observed other examples in which two vessels, combined in this way, served as models for the potter, one, a shell set within a cup, is illustrated in the Third Annual Report of the Bureau of Ethnology. Another is given in Contributions to the Archæology of Missouri.

Fig. 80 illustrates a rather graceful form of bottle. It is furnished with a rather high perforated stand or foot, and the body is fluted vertically with narrow widely separated channels. The neck is high and flaring and has a narrow notched collar at the base.

There are many good examples of engraved designs upon bottle-shaped vessels. One of the most elaborate is presented in Fig. 81. This vessel has a full, wide neck, a heavy, flattened body and a



FIG. 81.—1.



FIG. 82.—1.

broad rudimentary foot. The color is quite dark, and the surface well polished. The engraved design consists of four elaborate, interlinked scrolls, comprising a number of lines, and bordered by wing-like, triangular figures, filled in with reticulated lines. This latter feature is often associated with native delineations of mythic reptiles, and it is not impossible that this scroll work is a highly conventionalized form of some such conception. The four volute centres are slightly concave.

Three excellent examples of tripod bottles are illustrated in the accompanying figures. The first, Fig. 82, is a large-necked, rather



FIG. 83.—Arkansas.—J.

clumsy vessel of ordinary workmanship, which rests upon three globular legs. These are hollow, and the cavities connect with that of the body of the vessel. The whole surface is well polished and very dark. The vessel depicted in Fig. 83, has a number of noteworthy features. In shape, it resembles the preceding with the exception of the legs, which are flat and have stepped or terraced margins. The

whole surface of the vessel is decorated with characteristic designs in red and white upon a warm gray ground. A stepped figure, resembling the Pueblo emblematic "rim of the sky," encircles the neck, and semicircular figures in white appear on opposite sides at the top



FIG. 84.—Arkansas.— $\frac{1}{3}$.

and base. The body is covered with scroll work in broad red lines, the spaces being filled in with white in the form of a thick earthy paste. Each of the legs has one-half red and the other white.

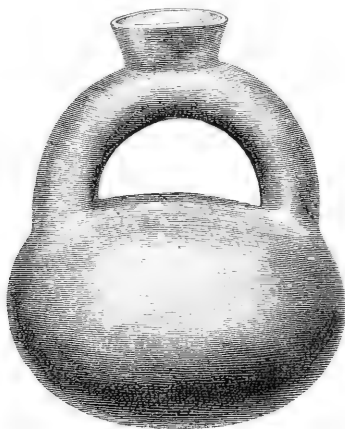


FIG. 85.—Pecan Point, Ark.— $\frac{1}{3}$.

The vessel illustrated in Fig. 84, is of the ordinary, dark, polished

ware, and is entirely plain. It is peculiar in the shape of its extremities. The neck resembles a long truncated cone, and the legs are heavy and conical, being not unlike those of a common iron pot.

Eccentric forms.—In this place I am able to give but one example of what I have denominated eccentric forms. Others have been indicated on preceding pages. The vase given in Fig. 85 has a flat-tish, ovoidal body from the opposite ends of which, for it is slightly oblong, springs a hollow arch—a sort of double neck. This has been perforated at the highest point, and a low recurving rim, which serves as the mouth of the vessel, has been attached.

Another example of this form has recently been received at the Museum. It is in fragments, but was originally nicely finished and elaborately painted. Illustrations of others may be seen in the Third Annual Report of the Bureau of Ethnology, and in Contri-

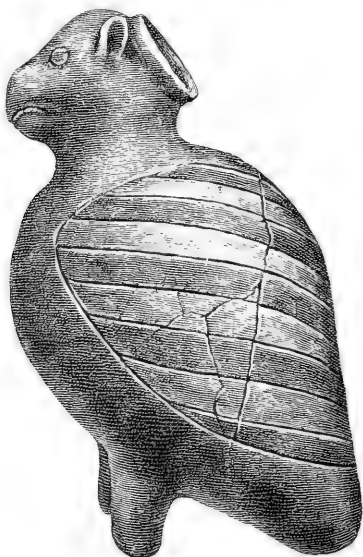


FIG. 86.—Arkansas.— $\frac{1}{2}$.

butions to the Archæology of Missouri. The specimen illustrated was found at the foot of a skeleton in a grave at Pecan Point.

This shape is common to the art of many countries, and was a great favorite in ancient Peru.

Life forms.—In the introduction to this section, I have indicated the many ways in which the human form is employed in the enbel-

ishment or the elaboration of bottles. Birds, beasts, fishes, and reptiles are treated in a similar manner.

The owl was a favorite subject with the potter, on account probably of the upright, compact figure of the body, or possibly because of some especial regard in which this bird was held.

A rather handsome specimen is shown in Fig. 86. The modeling is more than usually successful, and the surface is carefully finished. The wings are treated in a pleasing, but highly conventional manner. The feathers are indicated by alternate bands of pale-red and yellow-gray, the latter being the ground color. These bands are outlined by fine incised lines. The remainder of the body is painted red. The vessel rests upon the feet and tail—a natural tripod. In many cases the head of the bird forms the top of the neck of the bottle—the body of the vessel itself being plain and globular.



FIG. 87.—Hale's Point, Tenn.— $\frac{1}{3}$.



FIG. 88.— $\frac{1}{3}$.

The heads of animals are treated in the same manner as may be seen by reference to Figs. 87 and 88.

The head shown in Fig. 87, is clearly that of a bear. The whole vessel is painted red. Fig. 88 illustrates a small dark bottle, surmounted by a head of nondescript character. The aperture in these vessels is generally at the back of the head.

Fish and reptiles appear somewhat more rarely in connection with high-necked bottles. The Museum has recently acquired a fine example, painted in red and white which has the head and other features of a fish, modeled in relief upon the sides and bottom of the body. A small, dark vessel of like character is illustrated in the Third Annual Report of the Bureau of Ethnology.

In the example given in Fig. 89 the upper part of the neck has been modified in such a way as to accommodate a curious, medallion-

like relievio of the human face, while in Figs. 90 and 91 the neck is replaced by grotesque heads, the latter being intended apparently for an owl.



FIG. 89.—Arkansas.— $\frac{1}{3}$.

These potters dealt with the human figure in a very bold manner for savages. They were evidently capable of representing many creatures with accuracy, but preferred grotesque or conventional

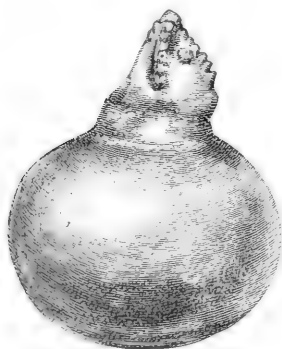


FIG. 90.—Arkansas.— $\frac{1}{3}$.

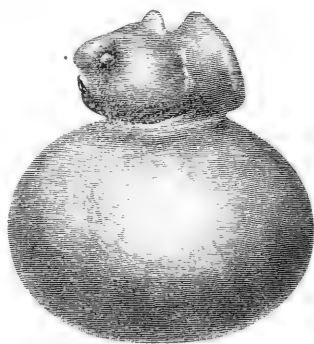


FIG. 91.—Arkansas.— $\frac{1}{3}$.

forms. A man or a woman is generally modeled with a large body and a curious hunched back, the vertebra appearing along the prominent ridge. The shoulder blades are usually shown with anatomical distinctness, if not with precision; the arms are long and slender and the hands rest upon the knees or the sides. The position

assumed is mostly that of kneeling or squatting, the feet being doubled up beneath and uniting with the bottom of the vessel.



FIG. 92.—Arkansas.— $\frac{1}{10}$.

These effigy vases are numerous, and greatly varied in size and color. They are mostly of the dark ware, but are found painted

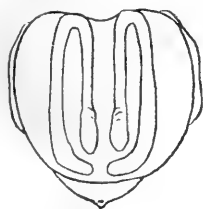


FIG. 93.

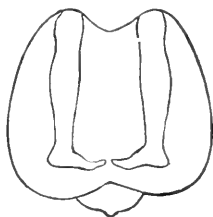


FIG. 94.

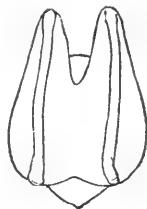


FIG. 95.

Showing positions of feet.

plain red, or in red and white figures, some of which represent parts of the costume, others, emblematic devices. The largest specimen

with which I am acquainted is illustrated in Fig. 92. It is well modeled, a good deal of attention having been given to the details of anatomy. The back is very much humped, and the vertebra are represented by a series of knobs. The position of the feet beneath the body is, perhaps, worthy of notice. This is shown in Fig. 94. It will be seen that the knees, calves, ankles, and the various parts of the feet are indicated with an approach to accuracy. The projecting back is seen below. The bottom of the vessel is nearly flat, and the legs are modeled in low relief upon it. Other positions are shown in Figs. 94 and 95.

Fig. 96 illustrates a characteristic profile.



FIG. 96.—Arkansas.— $\frac{1}{2}$.



FIG. 97.—Arkansas.— $\frac{1}{2}$.

One of these vases has a cross painted upon the breast of the personage represented. The kneeling position, taken in connection with the cross, leads to the thought that perhaps the potter lived in the period of the French missionary, and attempted to model him in clay. There is, however, no indication of costume, and the painting, with the exception of the cross, is in a purely aboriginal style of design. The ground color of the vase is as usual a moderately dark gray-brown, and the painted figures are laid on in thick, blackish paint. Lines partially encircle the eyes, and extend down over the cheek to the neck, and a line passes around the mouth and extends down over the chin, neck, and chest to the base of the body. The horizontal bar of the cross connects the nipples. The shoulder blades and the hands are also painted black. The back is very curiously modeled and painted.

There are in the collection a number of specimens that do not come under either of the preceding heads. Of these I may mention three small figures from Paducah, Kentucky, which represent a snake, a man, and a deer. They are very rudely done, and are possibly modern work.

Attention should be called to some small specimens resembling toad-stools or mushrooms in shape, some of which may have been stoppers for bottles, while others could have served as implements in some of the arts. One of these pieces has a distinctly vitrified surface. Its age, however, cannot be determined.

There are a few rude pipes of usual forms and of no special interest. The comparative scarcity of these articles, so plentiful in some of the mound districts, is certainly worthy of the attention of archæologists.

UPPER MISSISSIPPI PROVINCE.

I have already pointed out the fact that most of the pottery of the upper Mississippi region belongs to a distinct family. It has never been as abundant as the pottery of the more southern sections of the country and is not well represented in our museums. There are only a few pieces in the Davenport collection and these are all in a more or less fragmentary state. A majority are from a mound near the city of Davenport, but a limited number came from Wisconsin.

At this time it is impossible to define, with any degree of precision, the geographical limits of this class of ware. The tribes by whom it was manufactured have doubtless, at one time or another occupied the greater part of the Mississippi basin north of the mouth of the Missouri river. Similarities of material, shape, methods of manufacture, and ornamentation, tend to show that we must include the greater parts of the States of Iowa, Wisconsin, Michigan, Illinois, Indiana, and Ohio, in the area covered by this or closely related ceramic groups, and indications of its presence are discovered far beyond these limits. The mounds of Manitoba have recently furnished examples of this class of ware, and it has decided relationships with the ware of the eastern and northeastern States. It is not yet time to draw close distinctions, as sufficiently detailed studies of the products of the various districts have not been made.

On the shelves of our museums the difference between the two great families of the middle and upper Mississippi are strikingly

manifest. The ware of the former district, as already shown, exhibits variously tinted pastes tempered with coarsely pulverized shells or pot-sherds; the vases, as a rule, having full bodies, well rounded bases, and in very many cases narrow necks. They exhibit great variety of decoration and no little care in finish. The northern family shows a dark paste tempered with sand—often apparently granitic—a rough fracture, and generally a rude finish. The shapes are comparatively simple, often long, tapering below, and flat bottomed. The ornamentation is totally unlike that of the southern variety. It consists of cord impressions, incised lines, and implement indentations arranged in figures peculiar to the district.



FIG. 98.—Davenport, Iowa.— $\frac{1}{3}$.

There are many other features that, like the subtle characters of human physiognomy, cannot easily be described, but which are of first importance as indices of relationship or the lack of it.

A large number of the Davenport specimens were described and illustrated by Farquharson and Pratt in the first volume of the Academy proceedings. As the illustrations used were in outline

only, I take the liberty of reproducing one example—the finest—by wood engraving, Fig. 98. This vessel was found in a mound near Davenport along with human remains, and closely associated with other relics, among which were several copper implements covered with coarse woven fabrics. Its height is eleven inches, width of aperture seven and one-half inches, and diameter of base four inches. It is estimated to contain a little over one gallon.

There is a broad, shallow constriction at the neck. The walls are from one-fourth to three-eighth of an inch thick, and the margin of the rim is squared off, showing the full thickness—a strong characteristic of the northern pottery. The form is nearly symmetrical, and the surface is hand-smoothed but not polished. At present the paste is dark and crumbling, and shows a rough fracture. A large percentage of sand was used in tempering. The color is a dark gray-brown. The entire surface with the exception of a narrow band about the base has been covered with ornamentation. This is executed with considerable care, and shows a great deal of ingenuity and some taste. There is apparently no feature copied from nature or from ideographic art. Two or three distinct implements have been used. A part of the neck ornament was made by rolling back and forth a circular tool—a *roulette*—the edge of which was notched. A row of indented nodes has been produced upon the exterior surface of the neck by impressing upon the inside the end of a reed or hollow bone about one-fourth of an inch in diameter. Patterns of bold, rather carelessly drawn lines cover the body and seem to have been made by trailing, under pretty strong pressure, the smooth point of a stylus—probably the bone or reed already suggested. Some of the larger indentations upon the lower part of the neck may have been made by the same implement held in an oblique position. The use to which this vessel was applied can hardly be guessed. It was found with the remains of its owner, and probably contained food or drink.

Another smaller vessel from the same locality and found under similar conditions shows the same characteristics of material, form, and ornament. There are also a few other fragments of the same ware from this group of mounds. One of these shows that decoration by the indentation of twisted cords was practiced here as elsewhere. A similar vase tastefully decorated with indented lines about the neck, and a band of decoration consisting of broad, plain, sinuous

bands upon the body, comes from a mound in Scott county, Iowa. Height six inches, diameter the same. The rims of all these vessels are square on the edge, showing the full thickness of the walls.

A very interesting vessel obtained by Captain Hall from a mound in Wisconsin is represented by a number of large fragments, probably comprising about one-half of the walls. It has been somewhat larger than the vase given in Fig. 99, and in a general way resembles it closely. It appears to be more pointed below than the other, and has a slightly flaring rim. The walls are one-fourth of an inch thick. The paste is coarse and is tempered with sand, as in the cases already described. The lower part of the body is covered with nearly vertical cord marks. The upper part was smoothed, rather rudely, for the reception of additional decoration, which consists of several bands of indented figures. The principal implement used was apparently a stiff cord or a slender osier wrapped with fine thread, which has been laid on and impressed with the fingers, forming nearly continuous encircling lines. Bands of short oblique lines also occur. Just below the margin there is a line of annular indentations made from the exterior, leaving nodes on the inside, the reverse of the treatment noticed in the vessel already illustrated.

Fragments of identically marked ware from the vicinity of Prairie du Chien may be seen in the National Museum.

A large fragment from Baraboo county, Wisconsin, shows a full body and a slightly flaring rim. The upper part is ornamented with horizontal lines of annular indentations, and the body is covered with rather rude patterns made by rolling a notched wheel or *roulette* back and forth in zigzag lines.

Two handsome pieces of this ware were recently obtained by the Bureau of Ethnology from a mound in Vernon county, Wisconsin. The finest of these is six and a half inches in height, and in symmetry and finish, rivals the best work of the south. The paste is dark, compact and fine grained, and tempered apparently with sand. The color of the surface is a rich, mottled brown. The most striking feature of the decoration consists of a number of polished bands, extending in divers directions over the surface, the interstices being filled in with indented figures. The lip is smooth and the margin rounded. The exterior surface of the narrow collar is ornamented with oblique lines made by a *roulette*, and crossed at intervals with fine incised lines. The neck is slightly constricted

and is encircled by a polished zone, one and one-fourth inches wide, having a line of indentations along the upper edge. The body is separated into four lobes by four vertical, depressed, polished bands about one inch wide. Two of these lobes are crossed obliquely by similar polished bands. These bands were all finished with a polishing implement, and are somewhat depressed, probably the result of strong pressure with this tool. They are bordered by wide incised lines. The intervening spaces are indented with a *roulette*.



FIG. 99.—Illinois.— $\frac{3}{4}$.

A handsome little vessel obtained from a mound at Albany, Whiteside county, Illinois, is illustrated in Fig. 99. It apparently belongs to the silicious ware of the north. The shape and ornamentation are somewhat novel. Four large flattish lobes occur about the body on each of which a figure, somewhat resembling a Maltese cross has been made by incising or impressing broad, shallow lines. The remainder of the body is covered with marks that resemble impressions of a coarse osier basket. This specimen was collected by Mr. C. A. Dodge, and a short description has been published by Prof. W. H. Pratt in the third volume of the proceedings of the Davenport Academy.

GULF PROVINCE.

Our museums contain but few pieces of pottery from the lower Mississippi, and in the Davenport Academy collection there are probably not more than a dozen typical examples of the leading groups of ware of the Gulf States. Louisiana and Mississippi have furnished some very fine specimens of the pottery of the middle province, more refined perhaps in form, material and finish than the ware of Arkansas and Missouri, but still differing decidedly from the typical pottery of Alabama and Georgia. Not wishing at present to enter upon the detailed study of the latter class of ware, I shall present only the few examples furnished by the Davenport collection. The southern ware is characterized by refinement of outline, color, finish and ornamentation, and is distinguished from that of the middle Mississippi by its material, which is a fine-grained paste, tempered with very fine silicious matter instead of pulverized shells.

The little cup given in Fig. 100 is from Mobile, Alabama. It is pointed at opposite ends and was probably modeled after or within some basket or fruit shell, the impressions from which may be seen on the surface. The paste contains no perceptible *degraisant*.

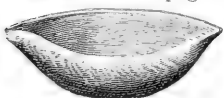


FIG. 100.--Alabama.— $\frac{1}{3}$.
no perceptible *degraisant*.

A favorite form is a bowl with full deep body and incurved lip.

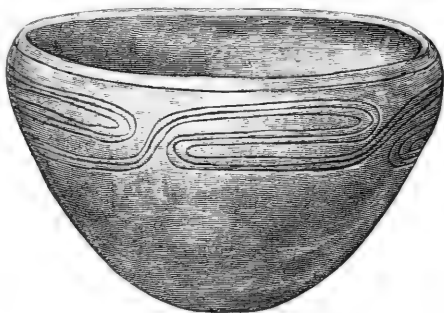


FIG. 101.— $\frac{1}{3}$.

A vessel of this class is illustrated in Fig. 101. The rim is but slightly incurved, while the body is considerably constricted below the greatest circumference. It is a unique and handsome speci-

men. The color of the slip is a pale, reddish gray, a little darker than an ordinary flesh tint. The paste is seen to be yellowish where the surface has been injured. The ornament is a simple meander, consisting of three incised lines. It is said to have been found in Arkansas. Other bowls of like form and of elegant finish are found in the collection. They are generally dark in color, and have large apertures, low walls and flattened bases. The meander, mostly in its more simple forms, is the favorite decoration.

The largest and most pleasing vessel of this class is from Alabama, and is shown in Fig. 102.



FIG. 102.—Alabama.— $\frac{1}{2}$.

The aperture is ten and a half inches in diameter, and the height nine and one-half inches. The form is full above and somewhat conical below. The walls are thin and even and the surface well polished.

The color is dark and shows the usual fire mottlings. There is no admixture of shell material, finely pulverized micaceous matter appearing in its place. The ornamentation is simple, but is applied in a way to greatly enhance the beauty of the vessel. It consists of a single broad zone of incised figures. A zigzag line me-

and the middle of the band and the intervening triangles are filled in with groups of straight lines. All the lines are well drawn and appear to have been cut with a sharp point in the dry clay.

Bottle-shaped vases are not found to any great extent outside of the Mississippi Valley, and are quite rare in Alabama, Georgia and Florida.

The piece illustrated in Fig. 103 is from Mississippi, and in most respects is identical with the ware of the Gulf Province. The paste is silicious, fine grained and quite hard. The color is slightly ferruginous and clouded with fire stains from the baking. The body is ornamented with the engraved figure of a bird apparently in-



FIG. 103.—Mississippi.— $\frac{3}{4}$.

tended for an eagle. The head with its notched and strongly curved beak, and conventionalized crest, occupies one side. The wings may be seen at the right and left, while the tail appears on the side opposite the head. The flattened base of the vessel occupies the place of the body. The lines have been scratched with a sharp point in the hardened clay. Certain spaces in the plumes, wings, and tail are filled in with reticulated lines.

The bottle presented in Fig. 104 is embellished with a rather remarkable design in color. The material is fine grained and without admixture of shell. The color of the paste is a pale, salmon gray. The surface is coated with a thick slip or enamel of whitish clay, very fine grained and smooth; upon this the design has been painted, not in the thick earthy color employed farther north, but

in what appears to be a dark purplish-gray stain. The design upon the body is wholly unlike anything yet described. It is developed



FIG. 104.—Alabama.— $\frac{1}{4}$.

in the light ground tint by filling in the interstices with the dark color. The peculiar character of this design inclines me to the view that it probably had an ideographic origin, although possibly treated here as pure decoration. The open hand is sometimes seen,

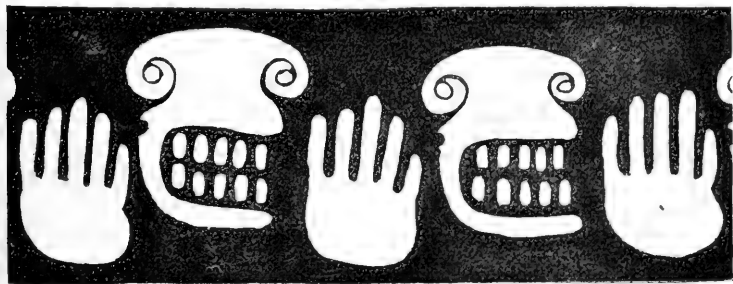


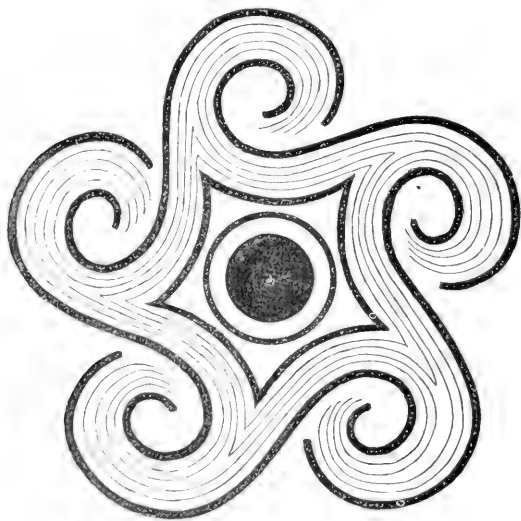
FIG. 105.

in both the decorative and the symbolic work of the Gulf coast tribes, and is not unknown elsewhere. The figures alternating with the hands are suggestive of a highly conventionalized face, the eyes being indicated by the volutes and the mouth and teeth by the

lower part of the figure, as will be seen in the fully projected design, Fig. 105. The neck has two indistinct bands of triangular dentate figures apparently painted in the dark color. The bottom is flattish and without the coating of light clay. Both paste and slip can be readily scratched with the finger nail. This vase was found in Franklin county, Alabama, near the Mississippi line, and is one of the first pieces acquired by the Academy.

In concluding this paper, I wish only to add that it has not been my ambition to solve any of the great questions usually uppermost in the minds of the theorist and the ethnologist—questions of time, race, and migrations. Regarding all the remains—the facts—of art as links in the great chain of progress, each having an intimate relation with every other fact, I have simply undertaken to classify them and to assign them to their proper places in the scheme of culture, just as the naturalist has learned to treat the elements of biologic science.

To him who, in a small way even, realizes the truth that all things in art as well as in nature are comprehended in the great scheme of evolution, and therefore equally worthy of the closest study, no apology is needed for the publication of the minutest details of art.



Design on a vase from Arkansas.

[The cuts used in this paper form part of a series prepared for the Fourth Annual Report of the Bureau of Ethnology.]

REPORT OF MOUND EXPLORATION NEAR PINE CREEK, MUSCATINE COUNTY, IOWA.

BY C. E. HARRISON.

On the 14th of the present month (September, 1883), Rev. J. Gass, W. H. Pratt, and myself visited a group of mounds situated on a prominent point on the edge of the Mississippi bluffs, about half a mile below Pine Creek, Muscatine County, Iowa—a position commanding an extended view up and down the river.

The group consists of ten mounds—two of which, however, are so small as to be scarcely noticeable. All of them except one—the second in size and elevation—seemed to have been previously explored. This one is of circular shape, about nine feet high and fifty feet in diameter.

Employing four men to assist us, we opened a trench across it from east to west, twenty-five feet in length and five feet wide, which we carried down to a depth of from six to ten feet, removing some forty cubic yards of earth. The earth was a light clay intermingled with a darker soil, very soft throughout—softer than has been met with in any mound we have previously explored.

After reaching a depth of about six feet, we found slight traces of ashes scattered through the earth in the central portion of the mound, and increasing in quantity as we proceeded downward. It was mixed with red clay, apparently reddened by burning. At the depth of nine feet, it was found that a somewhat uneven and discontinuous layer of ashes, in some places an inch in thickness, occupied a space of some three feet in width, beginning a few feet north of the center and extending across the excavation. On following this, it was found to divide, at about the center of the mound, into two branches, each about two feet wide, one turning to the south-west and westward, and the other to the south. The former was followed about ten feet, to its termination, and the latter about six feet, where it also ended. The earth was examined with the utmost care from the beginning to the end of the work, and not a particle of charcoal was found. The ash-bed rested upon the natural, undisturbed clay. Somewhat above the ash-bed were found a few scattered pieces of sandstone, some of which

appeared to have been burned; and on one side of one flat piece was adhering a small quantity of ashes. Three or four small bits of bone were found, but bearing no indications of the action of fire.

One piece of worked bone—a very fragile fragment, about four inches long, half an inch wide, and one-fourth of an inch thick—was the only implement of any kind we discovered, and this may have been accidentally dropped in the earth when the mound was in course of construction.

MOUND EXPLORATION NEAR JOSLYN, ROCK ISLAND COUNTY, ILLINOIS.

BY C. H. PRESTON.

On the morning of October 4th, 1883, I accompanied Mr. W. H. Pratt by rail to the little town of Joslyn, somewhat north of east and about twenty miles from Rock Island.

We went to explore a peculiarly situated mound, of whose existence the Academy had learned through an intelligent young farmer, much interested in the work of mound exploration. This gentleman, Mr. Hanna, met us at the railroad depot and carried us in his wagon to the farm of a Mr. Christ. Bartsch, some four miles north-east of Joslyn, where, in a secluded little valley, we beheld the beautiful, symmetrical, valley mound whose *raison d'être* we had come to investigate.

The little vale, in whose exact center both ways the mound stands, is about one hundred and fifty feet across from base to base of the bluffs, and some six hundred feet in length from where, on the north, it is formed by the junction of two small ravines, to where, on the south, it is bounded by a little stream which flows toward the east. Beyond the stream is a sparsely wooded bluff, while the rest of the low bluffs—some thirty or forty feet in height, which almost encircle the valley—are bare of trees, but were covered with corn on their upper levels and extending back. The valley itself, smooth and level as a meadow, was covered with tall, wild grass. The mound, which rose abruptly as if the third part of a sphere had been sliced off and placed there, was about seven and a half feet high by thirty feet in diameter, and perfectly round and symmetrical. We would have felt like vandals in destroying its beauty, but that the owner had determined on

leveling it down. He came with tools to our assistance, hospitably entertained us at noon-time, and after dinner secured us, at small expense, the additional help of a neighbor, so that by 4 o'clock P. M. we had finished our task and were ready to turn our faces homeward — not the less ready that a cold, drizzling rain, which set in shortly after we began operations, had continued throughout the day.

We trenched the mound from east to west across its center, making an opening sixteen feet long at the top, four feet wide, and eight and a half feet deep in the middle, and moving some fifteen or twenty yards of earth. For some distance down we found the earth soft like that of the mound at Pine Creek, and scattered through it, especially west of the center, were a few bits of a black substance which looked like charcoal, but were entirely structureless and soft.

We found not one particle of bone, or even of stone, save a very few small calcareous nodules interspersed from bottom to top. The clay was in some places of a rather more reddish-brown than in others, and streaked with seams of a very white substance, like that supposed to be ash in the mound at Pine Creek. At the depth of three and a half feet this seamed structure ended, the side of our trench showing very definitely in section its lower limit. Below it was a homogeneous, light brown earth, soon giving place to a gray stratum, almost like "blue clay," quite hard, and growing harder as we descended. There was no evidence whatever of any disturbance of the earth below the three and a half feet level, but this was at least four feet above the surface of the valley. What natural agency, whether of deposit or of erosion, could account for this perfectly circular raised mass of apparently primeval clay? Or, if artificial, what was the object of its builders? The most plausible conjecture presenting itself to our minds, as we stood there in the focus, as it were, of a great natural amphitheater, was, that these encircling bluffs had been the gathering-place of some ancient race, and this mound the altar or stage on which certain probably bloodless religious or festive rites were wont to be solemnized in the sight of assembled thousands, or whence the words of their chiefs could reach the ears of a gathered people. Other theories might be advanced, but no other seemed tenable.

Had the little valley once been a lake or swamp, the home of a succession of animal architects? In that case, the tumulus would have been made up largely of vegetable and animal *debris*. The soil of the valley, too, would have consisted, for a considerable depth, of humus or peat; but in reality the grass-roots reached a hard clay,

which was penetrated with difficulty by the spade. Plainly no muskrat or beaver tribe had left this monument of their industry and skill.

Had the waters, which, through all the ages since the old-time inland sea was first drained, have been wearing down the great branching system of ravines leading to the Mississippi and on to the gulf—had the tireless waters left here a dot of an island whose cohesion was such as to withstand their force? This might have been; but the branching stream would have left an island more or less pointed, both at its upper and lower ends, and not the perfect circle of our mound.

Had it perchance been formed by accumulation at the center of a whirling eddy? Such an accumulation of clay is hardly to be supposed, even if the configuration of the valley and bluffs and the strata of the mound were not fatal to the theory.

Did human hands construct here the foundation for a dwelling-place, a sacrificial altar, or a burial mound? In either case, there would have been evidences of fire, relics of handicraft, or animal or human remains, none of which were found.

At the bottom of our trench was a hardened crust, some three inches thick, of ferruginous clay intermixed with calcareous earth, and resting on what was evidently a natural drift-bed of coarse sand and clay. We had gone below the surrounding level and had found no evidence whatever of human agency, save that the side of our excavation, near the center, showed the triangular section of a previous superficial opening with its apex about three feet down, made, as our assistants stated, some years before, by a curious but easily satisfied resident of the vicinity.

We had found no relics; indeed, although our guide, Mr. Hanna, was quite confident to the last that we should come upon something of importance, we, remembering the experience of Mr. Gass in the exploration of two mounds similarly situated, had little expectation of doing so. No positive answers were given to our toilsome questionings, but the negative replies may some day prove of value.

BIOGRAPHICAL SKETCH OF DR. ROBERT JAMES FARQUHARSON.

BY W. D. MIDDLETON, M. D.

Dr. ROBERT JAMES FARQUHARSON was born in Nashville, Tennessee, on the 15th of July, 1824. His father, one of the early settlers of the State, was a Scotchman, and his mother a native of Kentucky. Little can be said here of his early history, save that he was an exceedingly apt scholar as a boy, which was shown in his entering the University of Nashville at the early age of fourteen, and graduating from that institution in 1841, or when only seventeen years of age, in that period having found time to take an extra course in the higher mathematics, at the earnest desire of the professor of that branch of instruction.

Letters of that date among his papers show high regard for him among those with whom he came in contact in his school life, one from the president speaking of him as "always first in his classes" and as always "most exemplary in his demeanor;" and another from Prof. G. Troost, which testifies to his application and to his "love for the natural sciences," as evidenced in his work with him as assistant during a survey of part of the State of Tennessee. The early leanings of the man in the direction in which most of his life work was done were, perhaps, determined by this contact with Dr. Troost, an old Hollander, of whom, long since deceased, he often spoke with evident affection. He read medicine in the office of a Dr. Jennings, of his native place, repairing to Philadelphia, then the center of medical education in this country, to attend lectures, and graduating from the medical department of the University of Pennsylvania in the spring of 1844.

At the age of twenty, we find him entering Blockley Hospital to serve for a year, meeting nearly all the great lights in medicine of that time on an intimate footing, and becoming fully acquainted with all the improvements in the art of healing which the knowledge of the schools furnished. He graduated from the hospital service with honor, and had found time, also, to obtain the diploma of the Obstetric Institute — a hospital institution for practical instruction in that branch of the science.

There are many letters of that date among his papers showing the uniformly high esteem in which, in those days of his young manhood,

he was held by all who came in constant contact with him; and one could almost imagine some of them as written by those of us who were privileged to know him in his later years, so well do they describe some of his traits. For instance, Paul Goddard and Robert Morris, great physicians of that early day in Philadelphia, testify to his "high professional qualifications, as well as his uniformly amiable and gentlemanly deportment;" while George B. Wood, M. Clymer, Richard Ashurst, W. E. Horner, Samuel Jackson, and N. Chapman, all men whose names adorn the page of American medicine, speak in affectionate terms of his professional attainments, his general scholarship, his faithful service, his personal worth, and his unfailing amiability and kindness.

In 1845 he removed to New Orleans, to enter the ranks of active practitioners, and did much of the regular work of his profession, both in private practice and in hospital service, until 1847, when he entered the United States Navy as assistant surgeon. Letters to his father still exist, showing his extensive travel, during his naval service, in many parts of the world, and full of evidences of that keen observation which we all knew him capable of in his later years. It was during this service, and while on duty on the schooner Taney, on the coast of Africa, that he contracted that deafness which was, in his own estimation, so great an affliction, and which caused him to shrink from embracing so many opportunities of widening his sphere of usefulness, from a hyper-sensitive idea that communication with him was laborious and annoying. Letters from his superiors in the service during this period again mention his "skill and assiduity in his attention to the sick," and speak of his "deportment, both moral and professional, as being such as to command the entire esteem of all his associates."

He resigned from the navy in 1855 to marry Miss Lydia Smith, of Nashville, who, with four children, after a happy married life of nearly thirty years duration, still survives him. After his marriage, he settled in his native city to practise his profession, and was occupied in professional pursuits of the usual kind till the outbreak of our civil war.

Those of us who knew his love for the old flag (and he often spoke of the impossibility of conceiving how one who had served his country as an officer, and taken the oath required prior to such service, could ever turn against that flag) can imagine the energy with which he threw himself into the opposition to the secession movement in his native State; and some of us who knew the fire in his nature can well under-

stand the fierce things he must have said in those days of trial, which were, he said, still remembered against him, and made life in the South, among his old associates, unpleasant to him. He was a confidential friend of Andrew Johnson, and, after the occupation of Nashville by the Federals, soon found employment for his professional talents in the military hospitals of the city. He was also appointed by Johnson surgeon of his own regiment—the Fourth Tennessee Infantry—but his deafness caused his resignation very shortly. During the years 1863 and 1864 he had charge of an extensive hospital at Nashville—that of the military railroad system—which he closed in January, 1865.

The termination of the Rebellion found him with the largest part of a fair fortune swept away, and he moved to the southern part of Arkansas to practice his profession, doing active and laborious country practice there until the year 1868, when he removed to Davenport.

He identified himself with the Academy of Sciences and its work very soon after his arrival, joining it in the first year of its existence, and taking a very active part in all its work from that time until his removal to Des Moines, in 1880, as its proceedings attest. He served as its President in 1878, as its Librarian for three years, as a member of its Library and Publishing Committee for six years, and of its Committee on Museum for three years. He represented it at the meeting in Detroit, in 1875, of the American Association for the Advancement of Science, of which he was a permanent member, and he has left in its published proceedings the following papers:

In Vol. I.: "Do Rifle-balls Burn when Striking the Animal Body?" "A Study of Skulls and Long Bones from Mounds near Albany, Illinois;" "Recent Archæological Discoveries at Davenport, Iowa."

In Vol. II.: "On the Inscribed Tablets found by Rev. J. Gass;" "Post-mortem Examination of a Boa-constrictor;" "Formation of Ground Ice on the Rapids of the Mississippi."

In Vol. III.: Annual Address, as President, in January, 1879.

He was more thoroughly conversant with its library than any other member of the institution, having given it, for years, his constant and valuable care, and having personally contributed very largely to it; among other valuable donations, a gift of his being a series of the reports of the French Academy in the original. He was a constant visitor at its rooms, always interested in its welfare, and always one of its wisest counsellors; thoroughly informed, and never hasty in his conclusions.

His friendship for the young naturalist, J. Duncan Putnam, was something almost unique in its warmth. The writer has often heard him lament the paucity of American youths with the same untiring energy, the same unselfish devotion to science, and the same thoroughly correct habits of thought, as that lamented member who passed away before him.

His studies of ethnological character were pursued with that vigor, perseverance, and patience which marked all his investigations, and judges of such work fully appreciated them. In 1880 he was appointed by the French Société Ethnographique its member for Iowa, with power to recommend any further additions to its membership; and this he always considered one of the highest honors ever paid him.

His life in Davenport, aside from his Academy work, was marked by little that could furnish material of interest for this memoir. His retiring disposition and the singular sensitiveness he displayed in regard to his deafness rendered his strictly professional work somewhat meagre and unproductive. The bulk of this was done as a consulting physician; and those who knew the full value of his ripe scholarship in medicine frequently appealed to him in this direction, and always found his counsel of great worth, and his regard for the ethics of consultation as lofty as those of any man who ever lived.

He was elected a member of the visiting staff of Mercy Hospital in 1870, and served in that capacity till his removal to Des Moines, being then transferred to the consulting staff; and many a poor creature who profited by his ministrations in that institution remembers with gratitude his great skill and his thoroughly kindly and sympathizing treatment. While serving on the hospital staff, he planned and supervised the construction of the outlying ward for contagious diseases, known as St. John's, in which the practical application of sanitary construction has almost reached perfection; and the plans for this building have since been published and commended by all the sanitary authorities of the country, and in several places adopted.

It was in the direction, however, of the movement of the advanced thought of his profession, viz., that of *prevention* of disease, that, for years, he had thrown the best energies of his active mind; and it was in operations like a complicated analysis of drinking-waters, such as he made for the Board of Health of Rock Island, and in statistical observations of disease, as in state or municipal hygiene, that he found most pleasurable occupation; hence, it was with real pleasure that, in 1880, he accepted the position of Secretary of our State Board of

Health and removed to Des Moines to enter upon its duties. It was but a short time till his associates in that bureau found that a master had taken charge of the work, and his advice and his plans in the task before them soon came to be law in all the operations of the organization. His term of service was all too short, unfortunately, but his methods and his forms of deduction we hope may remain impressed upon the work in its continuance, and so surely secure for the health board of Iowa as high recognition among such organizations as is now accorded to that of Massachusetts or any other of the older States. That the work lost a masterly mind in his untimely death, there is no manner of doubt.

He was a member of the Sanitary Council of the Mississippi Valley and of the American Public Health Association, in both of which organizations his worth as a leader in sanitary methods was fully confessed; and as a member of the Iowa State Medical Society he left his impress on its proceedings in several important papers, an account of original observations on "Leprosy in the State of Iowa" attracting much attention.

His death occurred on the 6th of September, 1884. For several months prior to this time, those about him had noticed a slight failure in strength gradually creeping over him, marked simply in a slight stoop in his usually erect figure and a certain feebleness in his generally sprightly step. On the 18th of August he was attacked with dysentery, and lingered, with varying hopes on the part of his friends and relatives, until the date mentioned, the preëxisting debility probably having determined the fatal issue.

Having enjoyed for years the friendship of such a man as the subject of this short sketch, it seems difficult now to portray in fitting terms the many beautiful traits of his character, or to fairly set forth the points in daily contact with him which made such friendship so highly enjoyable. The verdict of all who knew him well, as seen in those early letters already mentioned, and as expressed by those who knew him in his later years, is that he was always thoroughly courteous, kindly, and gentlemanly; and surely no man ever laid higher claims to the ancient title of gentleman than he.

His favorite novelist was always Thackeray, and of all his characters he most admired Philip. Like Philip he must have been in his younger days, when full of that southern fire, which still showed signs of its presence, and flashed out fiercely enough on occasion; but most, since we knew him, at an age when "the heyday of the blood is tame," did he seem to fully resemble dear old Thomas Newcome, in all his gentle-

ness, and patience, and chivalrous ideas of honor, with whom he has at last answered "Adsum."

His mental equipment was of the highest order, and the vast stores of his mind had been gathered from an omnivorous reading, pursued under all kinds of circumstances. It was an idea of his own that perhaps his deafness had allowed of a greater concentration on his reading than would have been possible in one whose hearing rendered him more sensible of external disturbances. However that may be, his reading always seemed more profitable to him than that of less favored mortals, and all he read seemed to remain and take orderly shape in his wonderful memory. With all this, his opinions were never given in positive or offensive form, and the modest and retiring habit of his nature revealed itself in the expressions of his ideas and beliefs. Aside from a simple scientific desire for accuracy, there was a profoundly reliable and truthful character in all the utterances of the man, a remarkably high sense of honor appearing in all his intercourse with his fellows. To him any evasion, or anything short of clear and explicit honesty, was disgusting, and many opportunities of self-advancement had been lost to him from inability to color his conceived notions of right and truth. His value to science lay in this strict regard for veracity, and in a singularly keen faculty of observation, which had been sedulously cultivated from boyhood — probably from those early times when we find him aiding the old Dr. Troost in his work amongst the hills of Tennessee.

Having traveled much, read much, and found plenty of time for reflection, he was possessed of a fund of varied information seldom equaled, and in conversation and among his friends he was a rare man.

A deep spring of humor constantly welled up in him, and flashes of a kindly wit that never wounded illuminated much of his communication with those with whom he came in daily contact. He was essentially kindly and sympathetic, full of that charity which is so marked a feature of his profession, and, "not ignorant of misfortune, he knew how to pity others."

In his domestic relations he was singularly happy, and no more beautiful family circle ever existed than that of which he was the head, as all can testify who have been privileged to visit his home. A kindly, chivalrous gentleman, a fond husband and father, a delightful companion, a constant friend, a ripe scholar, and a faithful votary at the altar of science, we deeply regret that greater length of days was not granted him, that his work might have been full and rounded up with the honest effort which he had found to be the key to all mysteries but that into which he has passed.

SYNOPSIS OF PROCEEDINGS
OF THE
Davenport Academy of Natural Sciences,
1882-1885.

[In this abstract of the proceedings of the Academy the records of routine and unfinished business and of meetings of the Trustees are omitted.]

January 6, 1882.—MEMORIAL MEETING.

In honor of Joseph Duncan Putnam, late President of the Academy, who departed this life December 10th, 1881. The proceedings of this meeting were included in the records of 1881, and appear in Part III. of Volume III.

January 27, 1882.—REGULAR MEETING.

President C. H. Preston in the chair; fourteen members present.

Donations reported from Mr. F. A. Balch, Charles Hubbell, Prof. W. J. McGee; and also the shipment from Capt. W. P. Hall of some fifty vessels of ancient pottery, five skulls, and some stone and flint implements, from Arkansas mounds.

J. H. C. Petersen, of Davenport, was elected a regular member.

The President then announced the following Standing Committees for 1882:

Committee on Finance—F. A. Balch, E. P. Lynch, H. C. Fulton.

Furnishing Committee—Mrs. C. E. Putnam, Charles E. Harrison, Dr. C. T. Lindley.

Publication Committee—Mrs. C. E. Putnam, Prof. W. H. Barris, Dr. C. C. Parry, William H. Pratt, Dr. C. H. Preston.

Library Committee—Miss Julia E. Sanders, J. R. Bowman, Miss L. M. Pratt.

Museum Committee—W. H. Pratt, on Archaeology; Prof. W. H. Barris, on Geology and Paleontology; D. S. Sheldon, on Zoölogy; Miss Julia Sanders, on Entomology; J. J. Nagel, on Botany.

Dr. C. H. Preston tendered his resignation as Corresponding Secretary, not having time to attend to the duties of the office.

The Curator, Mr. W. H. Pratt, exhibited over two dozen crania which have been collected by Capt. W. P. Hall from ancient mounds in Arkansas, and explained the circumstances under which they were found, many of them having been buried, with other bones of the skeleton, in the large earthen vessels, of which a fine collection has also been secured. A considerable number of these skulls are very much distorted by artificial compression during life, flattened both in front and rear, making the breadth in some instances to exceed the length of the skull.

The Curator, Mr. Pratt, also exhibited an improved craniometer of his own invention and construction, and explained its use by applying it to several specimens. The skull being placed in an inverted position, is so supported in that position by two steel points, and when the several parts of the apparatus are adjusted, the length, breadth, height, and foraminal distance are all read off without measurement or change of position, giving at once all the important characteristics, except the capacity, which is found by filling the skull with flaxseed with a graduated vessel—the whole constituting an accurate and rapid method of measurement.

March 3, 1882.—REGULAR MEETING.

Adjourned from February 24th, on account of the "Art Exhibition" then in progress. Vice-President H. C. Fulton in the chair, and eleven members present.

Donations reported from Dr. G. E. Bowman, of Inland, Iowa, and Mr. A. S. Tiffany, Davenport. Also the reception from Mr. Gass of a curved-base pipe found by him in a mound at Muscatine, and two pipes from mounds near Paducah, Kentucky, obtained by exchange. One is of sandstone, the bowl being carved in the form of a human head; the other of clay, representing a horned animal, probably the buffalo.

The Committee on Art Exhibition reported net proceeds \$100.20.

Miss Dr. Jennie McCowen and Mr. Frank Edwards were elected regular members. Mr. W. H. Pratt was elected Corresponding Secretary to fill the vacancy occasioned by Dr. Preston's resignation.

March 31, 1882.—REGULAR MEETING.

President Preston in the chair; eight members present.

Mr. Benjamin Glime was elected to regular membership.

W. H. Pratt read a short paper on the artesian well at the glucose works in this city. He also presented a paper on certain bones (astragali) found by Captain Hall in southern mounds.

April 29, 1882.—REGULAR MEETING.

President Preston in the chair; eleven members present.

The following resolutions of respect in memory of Mrs. S. B. R. Millar and Major T. T. Dow, life-members of the Academy, were presented and adopted:

MRS. S. B. R. MILLAR.

Resolved, That in the death of Mrs. Millar society sustains the loss of a lovely and pure life, and a shining example of usefulness and beneficence, a noble incentive to others to do good while they have the opportunity; and,

Resolved, That in her decease the Academy mourns the loss of a life-member who was one of its earliest benefactors and most influential friends—one who contributed largely to the important work which went so far towards placing the institution in a position to insure its permanent existence and usefulness, and to whom is justly due the lasting gratitude of all its friends; and,

Resolved, That we tender to her son and other relatives our most sincere and heartfelt sympathy.

Resolved, That these resolutions be furnished to the city papers for publication.

MAJOR T. T. DOW.

WHEREAS, In the vicissitudes of human life, our respected fellow-citizen, the late Hon. T. T. Dow, has been taken from among us,

Resolved, That in his departure from the scenes of busy life, the Academy sincerely mourns the loss of one of its life-members and benefactors; and,

Resolved, That the community will miss the noble influence of an active, stirring business man, who was the friend of all useful and progressive public enterprises, an exemplary citizen and public officer, and in every respect a useful member of society.

Resolved, That we deeply sympathize with his family and friends in their great loss.

Resolved, That a copy of these resolutions be furnished for publication in the city papers.

L. R. Witherell presented a report on some curious forms of limestone found in Rock Island County, Illinois.

Mr. James Thompson was elected a Trustee to fill the vacancy occasioned by the resignation of Dr. R. D. Myers.

May 26, 1882.—REGULAR MEETING.

President Preston in the chair; eleven members present.

The following resolutions of respect in memory of Mrs. Sophie C. Gronan, regular member, and Mrs. D. S. Sheldon, life-member of the Academy, were presented and adopted:

MRS. SOPHIE C. GRONAN.

WHEREAS, In the death of Mrs. Sophie C. Gronan the Academy has lost a valued member, and society a rare representative of the goodness, intelligence, and grace of true womanhood,

Resolved, That we hereby testify our appreciation of her worth and deep sympathy with her bereaved family.

Resolved, That a copy of these resolutions be transmitted to the sorrowing husband, and also to the daily papers for publication.

MRS. D. S. SHELDON.

WHEREAS, By the decease of Mrs. D. S. Sheldon the Academy for the fourth time within a few short months is called upon to give up an honored life-member and co-worker,

Resolved, In her demise we recognize the loss to science of an efficient, thorough, quiet helper, and to the community of one whose fine mental gifts were supplemented by the best attributes of the heart.

Resolved, That a copy of these resolutions be transmitted to the bereaved husband, and furnished to the city papers for publication.

An amendment to the By-Laws was adopted, striking out Sections 7 and 8 of Article IX., thus abolishing the Furnishing Committee.

Mrs. C. E. Putnam was appointed a delegate to attend the meeting of the Iowa Academy of Sciences, to be held at Iowa City on June 1st.

Rev. Mr. Gass then gave a description, with blackboard illustrations, of a very remarkable mound near Wyoming Hill, in Muscatine County, of which he recently made partial exploration.

It was shown to be one of the most curious and interesting of the prehistoric works ever investigated in this part of the country, and one which may possibly throw new light upon the habits of the ancient people of whom so little is known as yet.

The mound is situated in the middle of a small area of fifteen or twenty acres of bottom-land, between and close to the confluence of two little creeks, almost entirely surrounded by very high bluffs, and having but a narrow opening in front, through which the Mississippi River is seen a quarter of a mile distant. The base of the mound is just above high-water mark. It is thus situated in the midst of a grand amphitheatre, where, if such were its purpose, it might be viewed by many thousands of people from the tops and sides of the surrounding bluffs. The mound is over thirty feet high, of oval form, the long diameter being nearly two hundred feet, but small and rounded on the top. It is composed of thirty-three distinct layers of earth, clay, sand, and gravel, dark and light, and generally very clearly defined; the whole interspersed with scattered fragments of charcoal in considerable quantity, and some of them quite large. Specimens of these several layers were exhibited, which will be preserved in the museum. In the bottom of the mound is an immense pile of slabs of sandstone, two or

three inches thick, and several feet across, disposed in layers, of which the bottom one, resting on the clay, extends almost to the outer edge of the mound, the next a great deal smaller, and so on up to the height of eight feet in the middle, in a very broad, flat, pyramid form, about twenty layers of these slabs forming the whole pile.

The above is the first large mound in the Upper Mississippi Valley of which any considerable exploration has been made, and some discussion was had as to the desirability and practicability of a further and more thorough exploration of it.

June 30, 1882.—REGULAR MEETING.

President Preston in the chair; twelve members present, and several visitors.

Mr. Charles Barnard, of Waukon, Iowa, was elected a corresponding member.

The Curator reported the shipment of nine boxes of southern archaeological relics from Capt. W. P. Hall, containing about fifty vessels of pottery, with a few other relics.

A paper by J. C. Arthur, on "Contributions to the Flora of Iowa, No. V.," was read by title and referred to the Publication Committee.

Prof. Herbert Osborn, of Iowa Agricultural College, being present, spoke at some length on the habits of *Thrips*, a small insect not very thoroughly studied as yet, which works considerable injury to the blossoms of fruit trees.

The President then, on behalf of several members, presented to the Academy a large photograph of Mr. W. H. Pratt, the Curator, finely framed, stating that it was placed upon the walls as a token of their high appreciation of his faithful, earnest, and disinterested work for the institution. Mr. Pratt being present, made a few remarks expressive of his heartfelt thanks for this generous donation and the great honor conferred.

July 28, 1882.—REGULAR MEETING.

President Preston in the chair; twelve members present, and several visitors.

Donations reported from Mrs. C. C. Parry, Dr. E. H. Hazen, and Mrs. Eliza Ayers.

Dr. C. C. Parry presented a brief narrative of his recent expedition to Oregon and West Columbia, speaking particularly of the pines found there, and gave a description of the several species in different locali-

ties. He also gave an account of meetings he had attended of scientific societies.

Miss Dr. McCowen reported that Judge W. W. Wilson, of Ohio, had sent to the Academy several specimens of fossil shells and corals, and offered to supply the Academy with others of that locality.

August 25, 1882.—REGULAR MEETING.

Vice-President Dr. M. B. Cochran presiding; ten members present.

The Publication Committee reported Part II. of Vol. III. completed and ready for distribution.

Mr. Clark F. Ansley, of Swedona, Illinois, and Mr. F. O. Davis and Miss Sarah Foote, of Davenport, were elected to regular membership. Prof. Herbert Osborn, of Ames, Iowa, and Mrs. C. R. Orcott, of San Diego, California, were elected corresponding members.

The following resolution of respect in memory of Mrs. Jennie True Miner was presented and adopted:

WHEREAS, The name of Mrs. Jennie True Miner has been lately transferred from the list of life-members to the more honored ranks of the departed dead, this Academy herewith desires to place on record its sorrowing tribute to her memory, not only as the faithful companion of one of our most honored Trustees, the late D. S. True, but also for her personal worth as a most estimable lady and a friend of science.

Mr. Pratt called attention to a fact which he had observed in regard to the growth of the silver-leaf poplar trees, viz., that the limbs point more to the northward than any other direction, so much so as approximately to indicate the points of the compass to the close observer.

Prof. W. H. Barris presented by title a "Description of three new Species of Blastoids from the Hamilton Group;" also a paper by Charles Wachsmuth, on "A New Genus and Species of Blastoids, with Observations on the Terminology and Structure of the Basal Plates in the Group generally;" which papers were referred to the Publication Committee.

September 22, 1882.—SPECIAL MEETING.

Called for the reception of a biographical sketch of the late J. Duncan Putnam, by Dr. C. C. Parry. The President, Dr. C. H. Preston, presided, and many friends of the deceased were present to listen to the reading of the paper, which had been thus long delayed on account of the absence of Dr. Parry in California. It was referred to the Publication Committee for publication in Vol. III. of the Academy Proceedings. At its conclusion, Prof. S. Calvin and Prof. T. H. McBride,

of the State University of Iowa, who were present, followed with brief remarks upon the valuable scientific work of the deceased.

The President, on behalf of several members and friends, presented to the Academy fine, large photographs of Dr. C. C. Parry and Prof. D. S. Sheldon; which were received and directed to be hung upon its walls.

September 29, 1882.—REGULAR MEETING.

President Preston in the chair; twelve members and many visitors present.

The donation of the True collection, by Professor Miner, in accordance with the will of Mrs. Jennie True Miner, was reported.

In response to an invitation from the Academy, Dr. P. Radenhausen, chemist of the Glucose Company in this city, delivered an instructive lecture on the manufacture of glucose, illustrating his remarks by numerous samples and chemical experiments.

October 27, 1882.—REGULAR MEETING.

President Preston in the chair; eleven members and several visitors present.

Donations reported from C. E. Harrison and W. H. Pratt.

Dr. P. Radenhausen and John George were elected to regular membership, and Judge W. W. Wilson, of Lebanon, Ohio, was made a corresponding member.

November 24, 1882.—REGULAR MEETING.

President Preston in the chair; eight members present.

Donations reported from O. W. Collett, W. W. Wilson, and C. F. Kellogg.

Rev. A. M. Judy and Edward K. Putnam were elected regular members.

December 29, 1882.—REGULAR MEETING.

President Preston in the chair; nine members present.

Corresponding members were elected as follows: Gen. John Bidwell, of Chico, California; Mr. J. A. Mahoney, of Ramelton, Ireland; Dr. J. Backmann, of Berne, Switzerland; Dr. R. Fresenius, of Wiesbaden, Germany; Miss E. McMeehan, of Camanche, Iowa; Prof. P. Farnier, of Paris, France.

Diagrams and reports of the foot-prints found in the rocks at Carson, Nevada, were made the subject for discussion for the evening, the

opinion prevailing that the impressions were not made by the foot of man.

January 3, 1883.—ANNUAL MEETING.

President Preston in the chair; thirteen members present.

The reports of the various officers of the Academy were presented and referred to the Publication Committee.

REPORT OF THE RECORDING SECRETARY.

TO THE DAVENPORT ACADEMY OF NATURAL SCIENCES:

The Recording Secretary begs leave to report:

Meetings.—The meetings held during the year 1882 have been as follows: Annual meeting, January 3d; memorial meeting in honor of the late President, January 6th; Darwin memorial meeting, June 6th; regular meetings of the Academy, 12; extra meeting of the Academy, 1; average attendance, 11 members and 5 visitors; Trustees' meetings, 3.

Entertainment.—A "Home Talent Art Exhibition" was held in the Academy building from February 15th to 25th.

Members.—Regular members elected, 11; corresponding members elected, 7.

Deceased.—Regular members, 1; life members, 4.

Present Membership.—Regular members, 116; life members, 58; corresponding members, about 268.

Visitors.—Paying visitors, 1,849; members, 2,458; visitors by invitation, business calls, etc., 1,648; total, including evenings and Sundays, 6,000.

LUCY M. PRATT, *Recording Secretary.*

January 3, 1883.

REPORT OF TREASURER.

The Treasurer, Mr. Frank A. Balch, presented his report of receipts and expenditures during the past year, of which the following is a synopsis:

RECEIPTS.

From annual dues.....	\$172 00
Membership fees.....	25 50
Door receipts.....	188 46
Sale real estate.....	100 00
Art exhibition.....	100 60
Publication fund.....	11 64
Medical society.....	5 00
Contributions.....	377 00
Advanced by E. P. Lynch.....	100 00
Advanced by Treasurer.....	45 97
	<hr/> \$1,126 17

EXPENDITURES.

Curator's salary.....	\$500 00	
Janitor's salary.....	180 00	
Door-keeper's salary.....	52 00	
Refunded C. E. Putnam.....	125 94	
Interest, C. E. Pickering ..	40 00	
Express on freight.....	40 14	
Fuel.....	72 07	
Gas.....	14 10	
Postage.....	26 67	
Taxes and insurance.....	20 75	
Incidentals.....	54 50	
	<hr/>	\$1,126 17

REPORT OF THE LIBRARIAN.

TO THE PRESIDENT AND MEMBERS OF THE ACADEMY :

The increase in the library of the Academy during the past year has been constant and regular, and about the same as the preceding year, and including works on the usual variety of subjects.

The whole number added is 2,465, and may be partially classified as follows :

Transactions of 45 societies in the United States.....	105
Transactions of 100 foreign societies.....	150
Government publications.....	100
Archæology and Ethnology.....	25
History and Biography.....	30
Geography and Statistics.....	10
Relating to Libraries.....	20
Medical and Health Reports.....	12
Educational.....	50
Astronomy and Physics.....	10
Meteorology.....	50
Geology and Palæontology.....	40
Zoölogy.....	12
Ornithology.....	3
Entomology.....	50
Botany.....	60
Odd numbers of newspapers, etc.....	105

Fourteen monthlies, ten weeklies, and two daily papers are received regularly.

It has been impossible, as yet, to prepare a catalogue of the library, which is very much needed, and it is hoped that this may be done within the coming year.

No binding has been done for several years, and the number of volumes which must be bound for proper preservation is rapidly increasing, and now amounts to several hundred, of which no exact enumeration has been made.

A section of shelving has been added, giving fifty feet additional space, and making the shelf room now occupied about four hundred and twenty feet, and more space is now greatly needed. About fifty feet of shelf room is occupied by the duplicates, which are of considerable value, and I would recommend that these be disposed of as soon as practicable to the best advantage in exchange for other books. These shelves would then be available for the other books, and in ad-

dition to this the remaining portion of the east wall of the library-room could be fitted up with shelving, affording one hundred feet more of space, all of which will soon be needed.

Respectfully submitted.

JULIA E. SANDERS, *Librarian*.

REPORT OF CURATOR.

TO THE PRESIDENT AND MEMBERS OF THE ACADEMY:

The additions to the museum during the past year have been somewhat less than usual, on account of want of means for exploration.

Captain Hall has added one lot of some fifty vessels of ancient pottery, five skulls from the mounds; and some other relics from Arkansas and Tennessee, which were collected in 1881. In addition to this, we received from him in March and June two shipments of the pottery, about two hundred articles in all, many of which were badly broken, but have been restored as far as practicable. With these were also a few stone implements and other relics. These he desired should be arranged in a case to stand in his own name, as the explorer and collector. Another shipment of five boxes from Captain Hall is now on the way.

Since the decease of Mrs. J. True-Miner, the remainder of the collection of the late D. S. True, Esq., has also been turned over to the Academy, filling entirely the cabinet case provided by her for the purpose, and forming a very fine addition to our mineralogical collections.

Two curved-base mound-builders' pipes, animal forms, have been added to the collection during the year by Mr. Gass—one taken by him from a mound near Muscatine, and the other purchased from the person who found it in a mound in the same vicinity. He has now also secured five more good specimens, and expects very soon to obtain possession of several others which have been found by his brother and some neighbors; which will bring the collection up to about fifty specimens. He also obtained, by exchange of mineralogical specimens from the Academy, five very interesting prehistoric relics which came from an ancient burial-place near Paducah, Kentucky.

In each of the other departments of the museum some valuable additions have also been made, which I will not now enumerate.

No new cases have been added, though all we have are rather crowded; but the whole has been partially rearranged and the specimens labeled and explanatory cards placed in the cases, as far as time would permit. The daily duties as Corresponding Secretary, with the necessary attention to visitors and the many incidental interruptions frequently occurring, have occupied a considerable portion of the time of the Curator; otherwise something more might perhaps have been accomplished in the museum work.

As soon as practicable, it is very desirable that casts should be made of several of the most important relics, and especially of the inscribed tablets. These will wholly or in part pay their cost by sales, and will be valuable for exchange. A not very expensive apparatus for cutting

and polishing fossil and mineralogical specimens might also in the same way be a matter of benefit to the museum and help to pay expenses.

More museum space is certainly already needed, but it is probably better for the present to devote any means we may be able to command to what is by far the most important work for the Academy—that of archaeological exploration, which has been the foundation of whatever success we have achieved.

We have been more favorably located for this research than any other society in America. We have availed ourselves partially—only partially—of the grand opportunity, and this only through the active interest of a very few individuals, and by so doing have acquired a reputation far beyond our expectations, if not beyond our deserts. This reputation abroad is shared, and some of its benefits received, by all our citizens. Let us hope that it may not be forfeited by a want of action in the immediate future. With the aid of Mr. Gass, who, though removed to some distance, would still find time to assist us in the work he so loves, with his experience in the work and his knowledge of the localities, and his acquaintance and influence with the people, we could accomplish as much with \$100 as a distant institution can with \$500.

The mounds are being rapidly destroyed and thousands of valuable relics exhumed and carried to the eastern States and foreign countries every year, and soon these remains of the work of a laborious race will have forever vanished from sight, and almost from memory, save what knowledge of them may be stored up in the collections made by those who have appreciated the importance of the work before it is too late.

The noted archaeologist, Dr. Phené, when examining our museum a few weeks since, remarked that the value of the wonderful collection was vastly enhanced by the fact that the relics were *found here*, and that such objects should always be preserved in the district to which they belonged. Now, shall they be kept here and the good work continued?

Collections in natural history and other departments may be as successfully prosecuted, perhaps, in the coming years as now, but in the archaeological work a small amount *now* will be worth more than ten times as much a few years hence, when the harvest is past. No other matter is, in my opinion, of so pressing importance to our Academy as this, and according to our faithfulness in it we stand or fall. At the same time it is reasonably to be hoped that the year has come during which we shall add considerably to our collection of the local fauna, which is a positive duty which the Academy owes to science and to the community by which it is sustained in its work, if it is so sustained.

All of which is respectfully submitted.

W. H. PRATT, *Curator.*

PRESIDENT'S ANNUAL ADDRESS.

BY C. H. PRESTON.

LADIES AND GENTLEMEN:

It is made the duty of your presiding officer to present, on retiring from the chair, a report of the progress of the Academy during his official term, and of the condition of its various departments as they pass to the care of his successor.

It would afford me much pleasure if I could point to the Academy year just ended as one of active work and extensive acquisition. We have not, indeed, been idle, but our available energy has been mostly spent in holding the prow of our craft up stream. In view, however, of the recent sad narrowing of our small force of workers, both by death and by removal to other fields, and of the almost disheartening financial outlook when the year began, we have, I think, cause for congratulation that this dark period in our history has been thus far safely passed. Owing to a combination of circumstances, we have been occupying an anomalous position. Brought, as it were, to the very top-wave of success, a dead calm has suddenly fallen, and we have found ourselves lacking both wind and steam—deprived of all means of progression. I trust we shall not, in the future, be left liable to a similar chance.

But if seemingly at a stand, we have made no inconsiderable progress. The appreciative notice of a recent distinguished visitor, Dr. Phené, and the enthusiastically commendatory report of the committee sent from the St. Louis Historical Association to inspect our archaeological collection, should incite both the Academy and the community to which it belongs to maintain and advance its good repute.

During the past year

THE MUSEUM,

as shown by the Curator's report, has been steadily though slowly growing through additions from various sources. It has been little indebted, however, to any aid from the treasury, but chiefly—save scattering contributions—to the continued, invaluable, gratuitous labors of Capt. W. P. Hall and the Rev. J. Gass, and to the generous bequest of Mrs. True-Miner, completing the "True" mineralogical collection. More valuable than all material acquisitions, however, have been the quiet labors of the Curator in restoring, classifying, arranging, and recording the thousands of specimens, old and new; for it is only by constant and laborious care that the museum can be made at once attractive and available for study.

The importance of retaining in his place one under whose hands our collections, as they stand, have almost wholly taken shape, cannot be over-estimated. To do so has cost us, owing to altered circumstances, an extra effort during the past year, and yet the services rendered have been in very small part repaid. I trust it may be possible soon to make some permanent and adequate provision for the Curator's work,

else the museum which is and should be an *organism*, attractive and growing, will lie here dead, a mere disintegrating heap.

The report of the

CORRESPONDING SECRETARY

shows about the usual number of letters received and written. It seems hardly fair to add the duties of this office, which require a large aggregate of labor, to the already onerous duties of the Curator, but their proper discharge by any one not constantly on hand and devoting himself to the affairs of the Academy is next to impossible. For the present, at least, our interests will, I think, be best subserved by continuing the two offices under one head.

The books of the

RECORDING SECRETARY

show about the usual number of regular and called meetings, with perhaps fewer meetings of the Board of Trustees than heretofore. It is difficult to secure the attendance of a majority of our fifteen Trustees, but the necessity for doing so does not, fortunately, very often occur. Our actual resident membership has been increased by the addition of eleven new members, less one deceased and three withdrawn, so that it numbers now one hundred and sixty-six, against one hundred and fifty-nine at the beginning of the year. The number of corresponding members has been increased by seven, and the average attendance at regular meetings has been eleven. With our membership it would seem that the attendance should be much larger; but, small as it is, it compares favorably with that of other similar organizations. Science has rightly many friends who are not themselves scientists; and we must remember, too, that those who meet here do so, often, at the expense of no small personal inconvenience, and with no regard to dividends, either in this world or the next. It is important, however, that our actual, interested working force should be as large and enthusiastic as possible, and we should seek to interest and enlist the many bright young minds just unfolding into activity around us. One really earnest new member each year would be a great acquisition. If the community could only be made to see the importance of devoting more attention to natural and industrial science in the schools, the latter and the Academy would become more mutually helpful. I have faith to believe that such a change toward practicality in our common school system will be one of the great forward strides of a not distant future. When that time comes we shall not lack for workers.

THE LIBRARIAN'S REPORT

shows an addition of one hundred bound and over twelve hundred unbound volumes and pamphlets; making, with the more than six thousand separate works at the beginning of the year, a total of about seven thousand five hundred scientific treatises and reports, exclusive of daily and weekly exchanges. A library like this, devoted to one field, is of relatively far greater value than a miscellaneous collection of equal size, and its importance to the community will rapidly increase with its

growth. For its greater usefulness, however, a catalogue is very much needed. Perhaps the best, because constantly the most complete, would be a card catalogue, bringing together all treatises and articles on each subject for convenient reference. In this age of many books, some such labor-saving device in the interest of the reader is a necessity for the accomplishment of thorough work, and if once completed to date, such a catalogue would not be difficult to keep up. That the library has attained to its present quite creditable proportions is largely due, as you well know, to the publication of our

PROCEEDINGS,

and if it is still to grow, the publication must be steadily maintained. Only through it can we be kept on the exchange list of other scientific institutions. During the past year Part II. of the current volume has been published, and the closing or memorial part, in honor of the memory of my lamented predecessor, is nearing completion. Owing to the scarcity of means for pushing the work, however, I regret to say that some important papers have been reluctantly withdrawn by their authors to secure earlier publication elsewhere. Such a necessity ought not to exist. While it would be unwise and unscientific for us to be more concerned in issuing books than in gathering material worthy to fill them, neither should we err on the other side and lose valuable material by delay.

The report of the chairman of the Publishing Committee shows funds available, lacking only about \$100, sufficient for the completion of Volume III. This deficit, I trust, will soon be made up. Thus far our publications—Volumes I., II., and III., inclusive—have cost an aggregate of about \$3,000; an amount to be offset, however, by fully \$1,000 cash return, besides much more than double as much in value of books received in exchange; so that, to say nothing of its intrinsic worth, the publication of proceedings has proved a financial success. I would, however, suggest for your consideration the propriety of adopting a somewhat modified plan when we shall be ready to begin the publication of Volume IV. Inasmuch as the mere business record is of little interest outside our own membership, would it not be better to publish this only at intervals of several years, meanwhile issuing, in separate sheets, from time to time as they are presented, such important papers as may be received? These, consecutively paged, could be brought together into volumes of determinate size, for which subscriptions might be taken in advance. Such a method, I believe, is pursued by many similar societies, and is generally preferred by authors, since their work is thus brought more promptly before the public. But, by whatever plan it may be carried on, I trust the unquestioned importance to the Academy of maintaining the publication will call forth effort sufficient to that end.

THE TREASURER'S REPORT

for the past fiscal year, independent of the publication receipts and expenses, but including the new burden of Curator's salary, shows

an excess of expenditure above receipts, if accrued interest were all paid up, of one hundred and thirty-seven dollars. All but about ten dollars of this difference, however, represents arrears from the preceding year.

It would be pleasant, of course, if the balance were on the other side of the account, and if the report could show a much greater expenditure for explorations and original work; but, all things considered, we have no reason to feel discouraged. Another year, probably, much more can be realized from entertainments, lectures, etc., than it was advisable even to work for in this. If, too, we can but keep moving, the number of those who are both able and willing to help in the work will doubtless increase.

It is with institutions as with individuals: the world is most ready to assist, not those who are struggling for, but those who have achieved success. It is doubtless well for us that heretofore we have not been free from financial straits; but henceforth, if I mistake not, we could make judicious use of a rather larger allowance of funds. Of the many other than financial needs which I might, but will not, rehearse, by far the most essential is work — work in the various fields now but skimmed or lying fallow; work — earnest, patient, and hopeful. With this, all else will be added.

In conclusion, allow me to express my heartfelt thanks for the kind consideration and helpful coöperation which I have experienced at your hands throughout the year. It has been my single aim to advance the best interests, present and future, of the institution over which I have had the honor to preside, and such, I know, will be the aim of him to whom I now have the pleasure of resigning the presidential chair.

ELECTION OF OFFICERS.

The following officers were elected for the ensuing year:

President — E. P. LYNCH.

First Vice-President — DR. E. H. HAZEN.

Second Vice-President — H. C. FULTON.

Curator — W. H. PRATT.

Treasurer — H. ST. CLAIR PUTNAM.

Recording Secretary — MISS LUCY M. PRATT.

Corresponding Secretary — W. H. PRATT.

Librarian — DR. JENNIE MCCOWEN.

Trustees for Three Years — C. H. PRESTON, GEORGE P. MCCLELLAND, JAMES THOMPSON, F. A. BALCH.

STANDING COMMITTEES

announced by the President at the following meeting:

Finance — C. E. HARRISON, H. C. FULTON, JAMES THOMPSON.

Publication — Mrs. C. E. Putnam, W. H. Barris, W. H. Pratt, C. C. Parry, C. H. Preston.

Library — Dr. Jennie McCowen, H. St. Clair Putnam, J. M. De Armond.

Museum — W. H. Pratt, W. H. Barris, William Reipe, Miss Julia E. Sanders.

January 26, 1883.—REGULAR MEETING.

Vice-President Fulton in the chair; eleven members present.

Mr. Tyler McWhorter, of Aledo, Illinois, and Mr. G. H. Hinrichs, of Davenport, Iowa, were elected to regular membership.

In consequence of his removal from the city, Rev. Mr. Gass sent in his resignation as Trustee.

February 23, 1883.—REGULAR MEETING.

President Lynch in the chair; fifteen members present.

Mrs. Putnam, chairman of the Publication Committee, reported the printing of Part III. of Volume III. of Proceedings very nearly completed, all bills therefor paid as presented thus far, and only about \$125 needed to complete the volume.

The Curator reported a magnificent collection of mound-builders' pipes, thirteen in number, received from Rev. Mr. Gass, which were collected in Muscatine, Rock Island, and Mercer Counties during the past year by his brother and himself. The Curator further reported that the Academy had also received, during the past week, a collection of marine invertebrates, numbering over one hundred species, preserved in alcohol, and designated as "Educational Series No. 31," which are put up by the Smithsonian Institution for the use of such scientific institutions as will give satisfactory assurance that the specimens will be properly preserved and used.

Miss Cornelia McCarn, of Iowa, and Mr. Charles Bendix, of Franklin, California, were elected corresponding members.

Mr. J. B. Phelps was elected to fill the vacancy on the Board of Trustees occasioned by the resignation of Rev. J. Gass, removed from the city.

The resignation of H. St. Clair Putnam, as Treasurer of the Academy, was accepted, and Charles E. Harrison elected to temporarily fill the vacancy until next meeting.

March 30, 1883.—REGULAR MEETING.

President Lynch in the chair; ten members present.

Mr. C. E. Harrison, of the Lecture Committee, reported the net proceeds of an instructive lecture by Prof. F. F. Hilder, of St. Louis, at Library Hall on the evening of March 21st, to be \$29.65.

George W. French was elected to regular membership.

Charles E. Harrison was elected Treasurer in place of H. St. Clair Putnam, resigned.

The Curator reported donations from Capt. W. P. Hall, Rev. J. Gass, R. Smetham, and others.

The Publication Committee reported the completion of the printing of Volume III. of the Academy Proceedings, and placed copies of the same on the table.

April 4, 1883.—SPECIAL MEETING.

President Lynch in the chair.

The meeting was called for the purpose of taking action protesting against the proposed discontinuance of Davenport as a signal service observing station. Prof. D. S. Sheldon, C. H. Preston, and W. H. Pratt were appointed a committee to draw up a remonstrance against such removal. This committee thereupon prepared and presented their report, which was unanimously adopted, and they were instructed to forward same to Gen. W. B. Hazen, Chief Signal Service Officer, Washington, D. C.

April 24, 1883.—CITIZENS' MEETING.

Called by President E. P. Lynch, to devise measures for cancelling the indebtedness of the Academy and placing it on a firm financial basis. A large number of prominent citizens were present, the Hon. George H. French presiding. The sum of twelve hundred and ninety dollars was subscribed by those present for the object named, and Messrs. G. H. French, G. P. McClelland, and N. Kuhnen were appointed a committee to solicit further subscriptions.

Secretary McClelland presented and read the following letter from Prof. D. S. Sheldon, who was the first President of the Academy:

GRISWOLD COLLEGE, April 24, 1883.

MR. PRESIDENT: I exceedingly regret my inability to meet with you this evening and participate in your deliberations respecting the future of the Davenport Academy of Natural Sciences. I have watched the growth of the Academy from its very foundation to the present time with the deepest interest, and I feel an

honest pride in the position it now holds among kindred institutions of the world. It is an ornament and an honor to the city and the State in which it exists, and reflects the highest credit on the little band of workers who, amid fears and doubts and discouragements not a few, achieved these glorious results.

Has not the time come for the citizens of Davenport to put an end forever to their fears and anxieties, by adopting the Academy, with its accumulated wealth in natural science and archaeological lore, as its own foster-child, and by generous benefactions secure its permanency and help it onward to a still higher eminence? I believe the time has arrived, and in accomplishing so desirable a result, I would assure you, sir, of my heartfelt sympathy and zealous coöperation.

Very respectfully yours,

D. S. SHELDON:

President French, in stating the object of the meeting, spoke of the growth of the Academy of Sciences and its present condition. He stated that it had reached a place from which it could never be permitted to recede. It represented a cost price of some \$12,000, but this was probably not one-fourth of its real value. Its duplicates could not be reproduced for money in any amount. In some departments of work the Academy had already made a record for itself which is known throughout the world. Mr. French then observed that there is overhanging the Academy a debt of \$1,700, which ought to be, and must be, removed; the good name of the city of Davenport required it.

Among the citizens present and aiding the movement by active influence and generous subscriptions, were the following: Hon. J. H. Murphy, T. W. McClelland, William Renwick, E. S. Ballord, W. H. Pratt, C. E. Harrison, R. Smetham, N. Kuhnen, E. S. Carl, Isaac Rothschild, W. F. Ross, John George, Capt. R. R. Martin, Dr. E. H. Hazen, Dr. R. F. Baker, J. J. Nagel, Rev. A. Schulteis, J. M. Parker, James Thompson, John L. Miles, Hon. J. W. Thompson, George H. French, Edward Russell, E. P. Lynch, Rev. A. M. Judy, W. Reipe, A. S. Tiffany, A. F. Williams, G. P. McClelland, George H. Ballou, J. B. Phelps, J. R. Bowman, Judge N. French, Dr. C. H. Preston.

April 27, 1883.—REGULAR MEETING.

President Lynch in the chair; eleven members present.

Major George P. McClelland, from the auxiliary Finance Committee, reported subscriptions to the amount of \$2,175.

The Curator reported the receipt of three boxes from Capt. W. P. Hall, containing about sixty specimens of southern mound pottery, and a number of flint and stone implements. Also the receipt from Dr. S. C. Bowman, of Inland, Iowa, of several natural history specimens.

Mr. J. C. Tilton, of Davenport, was elected to regular membership; F. F. Hilder and O. W. Collett, of St. Louis, Missouri, were elected corresponding members.

May 4, 1883.—ADJOURNED MEETING.

President Lynch in the chair; eleven members present.

Major George P. McClelland, of the Citizens' Committee, reported the sum of \$2,735 on subscription list, and recommended that the balance remaining after discharging all present indebtedness be set apart and invested as a permanent endowment fund. The above subscription was subsequently increased to \$2,960.

On motion of Mr. N. Kuhnen, a committee was appointed, consisting of E. P. Lynch, Dr. E. H. Hazen, and James Thompson, to enquire into the expediency of opening the museum to the public on Sunday afternoons.

May 25, 1883.—REGULAR MEETING.

President Lynch in the chair; nine members present.

The chairman of the Publication Committee announced the completion of Volume III. of the Proceedings, and presented a detailed statement of finances, and, in connection therewith, the following report:

TO THE PRESIDENT AND MEMBERS OF THE ACADEMY OF NATURAL SCIENCES:

The Publication Committee announce with gratification the completion of Volume III. of the Proceedings. Part I. of this volume, containing the proceedings at the annual meeting, January 1st, 1879, with a list of donations during the year 1877, was published and distributed in June, 1879, with an edition of 1,000 copies, together with 1,000 extra reports, and cost \$239.90. Part II. of this volume was completed in August, 1882. The edition consisted of 1,000 copies, and cost \$227.94. Part III., which completes the volume, is now finished and ready for distribution. An edition of 1,500 copies of this part was published, at a cost of \$913.83. The total cost of this volume, therefore, amounts to \$1,381.67.

* * * * *

The amount necessary to meet this large expense has been obtained through subscriptions and donations, and all the bills for the publication of this volume are paid in full.

* * * * *

It will not be inappropriate at this time to state the total cost of the publications of the Academy. Volume I. cost \$1,064.42; Volume II., \$1,252.86; Volume III., \$1,381.67; making an aggregate expenditure on this account of \$3,698.95.

All of which is respectfully submitted, this 25th day of May, A. D. 1883.

MARY L. D. PUTNAM.
W. H. BARRIS.
C. H. PRESTON.
W. H. PRATT.

On motion, it was voted that the report be received and spread upon the minutes.

Dr. C. H. Preston presented and moved the adoption of the following resolution :

WHEREAS, Owing to an unavoidable combination of circumstances, almost the entire work of conducting the present publication has been left to the faithful and energetic chairman of the committee, Mrs. M. L. D. Putnam; therefore,

Resolved, That in accepting at her hands the completed and highly creditable work, Volume III. of the Proceedings, the Academy, including the rest of the Committee on Publication, do hereby tender her a most earnest vote of thanks in evidence of our appreciation.

Mr. James Thompson seconded the motion of Dr. Preston to adopt the foregoing resolution, with the following remarks thereon :

MR. PRESIDENT : In seconding the motion of acceptance and thanks just read, a few supplementary remarks may not be out of place in stirring up our minds by way of remembrance to the arduous and disinterested labors of the Publication Committee, now brought to a close. Nor can it be deemed ought but just and proper to make particular mention of the persistent and untiring efforts of the presiding officer of that committee, Mrs. Putnam, whose labors are thus crowned with such complete success.

However much we appreciate her work (*and we do, thoroughly*), no one but herself can actually *know*, not only the financial difficulties overcome, but also the physical and mental strain endured, in reaching this successful consummation.

With a clear perception of the benefits that would accrue to the Academy from the distribution of its proceedings to the world, she has worked incessantly, through good report and through ill report, in season and—not to say *out of season*—rather may it be said that in the “bright lexicon” of her devotion and zeal there were “*no such words*” as “*out of season*,” nor “*FAIL*.” So that the work begun, but left unfinished by the death of her honored son, our late lamented President, Joseph Duncan Putnam, was, principally by her exertions and in answer to *his* desires, carried out in the successful manner in which it is finished and now presented for our acceptance.

With unabated zeal in behalf of the Academy, as heretofore, on the part of the committee and its chairman, together with the public interest so generously displayed by its late subscriptions, is it too much to hope that in the *not* distant future, wealth and talents will enable the hopes of its friends to be realized? But, whether near or distant be that time, when it does come, “as come it will, for a’ that;” when, endowed and established on a sure foundation and the building extended and enlarged to its originally contemplated dimensions; when the portraits and statues of its founders and benefactors shall be in place in the great HALL of exhibition, prominent among them will be seen two of its former Presidents, those of MOTHER and SON (as in the ancient temples), representing at once a fulfillment and a prophecy—the fulfillment of hopes realized and labor accomplished, and the prophecy of the ever-increasing prosperity and usefulness of our beloved Academy.

The foregoing resolution was adopted unanimously, and, on motion

of Mr. C. E. Harrison, it was voted that Mr. Thompson be requested to furnish a written copy of his remarks, and that they be spread upon the minutes.

The following persons were elected to regular membership: Dr. W. W. Grant, J. H. Harrison, George Barker, Thomas O. Swiney, John H. Whitaker, Clark Richards, A. F. Cutter, W. H. Fluke, M. K. Parks, Miss Isabella Thompson, George F. Kramer, J. P. Van Patten, Dr. J. W. H. Baker, Henry Karwarth, C. S. Durfee, E. H. Ryan, A. D. Hathaway, B. F. Tillinghast, J. L. Mason, Mrs. J. J. Tomson, Judge N. French, W. C. Smith, E. Ludlow, W. P. Bissell, W. Hender, E. E. Cook, Hon. John W. Thompson, Miss Clara Decker, Col. Henry Egbert, W. F. Fidler, Walter Chambers, G. B. Grant, Dr. J. B. Morgan, Ross Woodmansee, John Hill, William Thompson, Dr. J. P. Crawford, J. R. Fleming, William Claussen, all of Davenport, Iowa; and the following were elected corresponding members: W. Davis, Iowa City, Iowa; Dr. H. M. Grant, Helena, Arkansas; and E. P. Vining, Omaha, Nebraska.

The resignation of F. A. Balch as Trustee, on account of his removal from the city, was presented and accepted.

May 30, 1883.—ADJOURNED MEETING.

President Lynch in the chair; eight members present.

An amendment to the By-Laws was adopted, fixing the membership fee at five dollars, covering dues for the year of election, and changing the dues to three dollars per annum, beginning with the year 1884.

June 29, 1883.—REGULAR MEETING.

President Lynch in the chair; four members present.

The following residents of Davenport were elected regular members: Dr. W. O. Kulp, J. A. Lumsden, A. W. Miner, C. D. Glass, John Stephenson, John Hoyt, E. A. Clark, Theo. Falk, Robert Burchill, Charles Priester, Gustav Becker, M. H. Cassell, Frank Kracke, J. S. Wylie, J. E. Merrill, Frank Carleton, A. J. Lerch, C. M. Leonard, C. Reupke, Thomas Murray, D. C. Garrett, W. H. Snider, J. J. Richardson, W. McCullough, C. A. Mast, C. S. Vincent, H. A. Emeis, John W. Ballard, J. J. Clevenger.

August 31, 1883.—REGULAR MEETING.

President Lynch in the chair; thirteen members present.

The Curator reported a very fine collection received from Capt. W. P. Hall since last report, most of which were laid before the meeting

for examination. This indefatigable collector of archæological relics being present, favored the meeting with interesting explanations and remarks, and especially urged that the Academy publications should contain illustrated descriptions of articles in our museum.

Mr. H. M. Henley, of Davenport, was elected to regular membership, and Mr. H. D. Crawford, of Ottumwa, Iowa, was elected a corresponding member.

September 28, 1883.—REGULAR MEETING.

Dr. E. H. Hazen, Vice-President, in the chair; fifteen members present.

The Lecture Committee reported an interesting lecture delivered for the benefit of the Academy by Prof. F. W. Putnam, Curator of Peabody Museum, Cambridge, Massachusetts, upon the subject of "Altar Mounds and their Contents."

A report of mound explorations at Pine Creek, Muscatine County, Iowa, was then read by Mr. Charles E. Harrison.

The Publication Committee submitted a report, of which the following is a synopsis:

At a meeting of the Board of Trustees, held on the 17th of September, it was decided to accept a proposition made by Mr. William H. Holmes, of Washington, D. C., on behalf of the Bureau of Ethnology of the Smithsonian Institution, to engrave for us plates of the pottery in our museum, on condition that the Academy would allow the Bureau to also use them in its publications, and it was referred to this committee to consummate such arrangement. The acceptance by the Academy of this liberal proposition necessarily compelled the continuance of the publication, and accordingly measures were taken for securing the necessary funds and engaging a publisher. The following recommendations were unanimously agreed upon:

- 1st. That the octavo form be retained.
- 2d. That the record of proceedings be continued, but in a condensed form.
- 3d. That the necessary means for publication be secured by subscriptions, donations, and entertainments.

After general discussion, the recommendations of the report were adopted.

The Curator reported donations from Capt. W. P. Hall, Dr. C. C. Parry, C. E. Harrison, Dr. E. S. Barrows, Aug. Haase, C. R. Orcutt, and Mrs. Bidwell.

The following persons were elected to regular membership: Professor Williamson, of Augustana College, Rock Island, Illinois, and Pro-

fessor Williams, William Goos, James Hartley, and Gustav Koch, all of Davenport, Iowa.

October 26, 1883.—REGULAR MEETING.

President Lynch in the chair; eight members present.

The Publication Committee reported that the work of publishing Volume IV. of Proceedings of the Academy had been placed in the hands of Mr. C. G. Plummer, and the first proof-sheets of the work were exhibited.

The Curator reported a valuable mound relic received from Mr. L. D. Woodruff, San Jose, California.

Mr. H. A. Pilsbry and Dr. W. W. Thackeray, of Davenport, were elected to regular membership; and Miss Rose Smith, of San Diego, California, Mr. Ellis Orr, of Postville, Iowa, and Mr. W. H. Holmes, of Washington, D. C., were elected corresponding members.

A proposition from Dr. Jennie McCowen, to deliver a course of lectures on physiology gratuitously to the young ladies of the city, was accepted.

A paper on "Lightning Conductors," by Prof. E. W. Claypool, was presented and referred to the Publication Committee.

November 30, 1883.—REGULAR MEETING.

President Lynch in the chair; sixteen members present.

The Publication Committee reported that a proposition had been made by Mr. W. H. Holmes, of the Smithsonian Institution, Washington, D. C., to engrave the pottery contained in the museum of the Academy at their own expense, on condition that the Academy should allow them to publish descriptions and use the plates after their use in our publication, which proposition had been accepted, and the work of engraving was now in progress.

The Curator reported the receipt, through Capt. W. P. Hall, of about fifty stone and flint implements, donations from persons residing in Southern Illinois, and also two skulls from mounds in Hancock County, Illinois.

Mr. Clarence Plummer and Dr. D. P. Maxwell, both of Davenport, Iowa, were elected to regular membership; and Prof. L. N. Hasselquist, of Augustana College, Rock Island, Illinois, and Prof. L. D. Woodruff, of San Diego, California, were elected corresponding members.

Dr. C. C. Parry presented the following obituary notice of his friend, the late Dr. John L. Le Conte:

Dr. John L. Le Conte, of Philadelphia, whose decease on the 15th instant is briefly noticed in late scientific journals, removes one more honored name from the brief list of honorary members. Belonging to a distinguished southern family of French descent, he inherited not only a taste for scientific pursuits, but also the means of prosecuting them, and quite early in life became noted as an entomologist, especially in the class *Coleoptera*, of which he has long been regarded as the principal authority in this country, and which he elaborated in numerous scientific publications, mainly in connection with the Philadelphia Academy, of which he was a prominent member. In prosecuting his scientific pursuits, Dr. Le Conte traveled extensively over our remote western regions at a time when explorations were much more difficult than at present, having proceeded as far as Fort Laramie soon after Fremont's first exploration, and subsequently spending a year or more in Southern California, in 1850 and 1851. Later in life Dr. Le Conte was connected with a railroad survey in Honduras, Central America, and in 1867 the writer was associated with him on a railroad survey through Kansas and New Mexico.

My first personal acquaintance with Dr. Le Conte was as a medical student in New York City in 1844-45, at which time he was chemical assistant to Prof. John Torrey, our mutual friend and instructor. Afterwards, in the winter of 1850, we again met at San Diego, California, during my connection with the Mexican boundary survey, and one of our joint discoveries was a remarkable maritime pine, which I had the privilege of dedicating to our honored instructor as *Pinus Torreyana*, Parry. [See description in Report of the Mexican Boundary Survey, and a recent notice in a paper presented to the San Diego Natural History Society, November 2d, 1883.]

Much of Dr. Le Conte's latest work was carried on in connection with an extensive scientific correspondence and occasional prolonged visits to Europe. His extensive and valuable collections properly go to the head-quarters of scientific entomology, at Cambridge, Massachusetts.

In his personal characteristics Dr. Le Conte was genial and free-hearted, taking special delight in encouraging the younger votaries of science and giving them the benefits of his enlarged experience. In this way he was especially kind and attentive to our late lamented associate, J. Duncan Putnam, when they met for the first time, at the Centennial Exhibition in 1876. Passing away in the full maturity of his powers, Dr. Le Conte's memory will long be cherished by his surviving associates, and an honored place assigned to him in the early ranks of the American devotees of science. Doubtless some more competent hand will do justice to his character and life-work in a more elaborate obituary notice of our distinguished honorary member.

Dr. C. C. Parry also read by title a paper on "Arctostaphylos, Adan: Notes on some of the United States Pacific Coast species, from recent observation of living plants, including a new species from Lower California;" which paper was referred to the Publication Committee.

December 28, 1883.—REGULAR MEETING.

Dr. C. C. Parry, President *pro tem.*; nineteen members present.

The Curator reported donations from Gen. John Bidwell, of Chico, California, and Charles E. Putnam, of Davenport, Iowa.

Dr. W. A. Paul and Prof. W. H. Hatch, of Rock Island, Illinois, and Miss A. J. Somerville McCrum were elected to regular membership.

A resolution presented by Dr. Clarence T. Lindley, for the formation of certain working classes in connection with the Academy, was adopted, and Rev. A. M. Judy, Dr. C. C. Parry, and C. T. Lindley were appointed a special committee thereon.

Various amendments to the constitution and by-laws, to make them conform to the articles of incorporation, were proposed and adopted. Article X. of the by-laws was revised so as to read as follows:

ARTICLE X. There shall be established a fund to be known as the endowment fund, and all money paid into the treasury for life memberships, and all money received from any other source and set apart for that especial purpose, shall constitute a permanent fund, of which the interest only shall be expended.

An invitation was extended to the Horticultural Society to hold its sessions this year in the Academy building.

Dr. C. C. Parry presented by title a paper on "New Plants from Southern and Lower California," which was referred to the Publication Committee; and Mr. O. W. Oestlund presented by title a paper on the "Spiders in the Entomological Collection of the late J. D. Putnam," which was also referred to the Publication Committee.

Dr. P. Radenhausen then delivered an interesting lecture on "Aniline Colors," which was listened to with interest by a large number of visitors in addition to the members present.

January 2, 1884. — ANNUAL MEETING.

President E. P. Lynch in the chair; nineteen members present.

The reports of the different officers were read, as follows:

TREASURER'S REPORT.

TO THE OFFICERS AND MEMBERS OF THE DAVENPORT ACADEMY OF NATURAL SCIENCES:

Your Treasurer respectfully reports the various accounts of his office as follows:

GENERAL FUND.	
To Academy funds.....	\$ 3 00
" membership fees.....	225 00
" dues for 1883.....	124 00
" dues for 1884.....	6 00
" dues for previous years.....	58 00
" subscriptions to fund.....	2028 33
" special contributions.....	30 00
" lectures.....	94 35
" special contributions to Mound Fund.....	40 00
" door receipts.....	223 15
" F. A. Balch.....	10 00
" Medical Society.....	8 00
	—————\$2849 83

By interest on Parsons' note to November 1st, 1882.....	\$ 42 00
" C. E. Pickering's note, paid May 10th, 1883.....	1000 00
" interest on same.....	86 66
" Charles Parsons' note, paid June 1st, 1883.....	600 00
" interest on same.....	29 50
" paid on Curator's salary.....	385 01
" paid on janitor's salary.....	180 00
" postage, freight, and express.....	99 03
" fuel and gas.....	117 82
" insurance.....	34 00
" expense of lectures.....	64 78
" drafts and exchange to W. P. Hall.....	40 10
" sundry bills (as per vouchers).....	86 58
" door-keeper.....	52 00
" paid on account of mound work.....	32 35
	<hr/> \$2849 83

SUBSCRIPTION FUND.

To subscriptions collected and deposited in the Davenport Savings Bank, as follows:

By James Thompson	\$ 530 00
" C. H. Preston	135 00
" E. P. Lynch.....	740 00
" J. B. Phelps.....	290 00
" N. Kuhnen.....	430 00
" G. P. McClelland	135 00
" John Bahls	60 00
" C. E. Harrison.....	365 00
" accrued interest.....	8 72
	<hr/> \$2693 72

Paid by checks:

C. E. Pickering's note and interest.....	\$1086 66
Snider & Miles, insurance.....	34 00
W. H. Pratt, Curator, on account.....	201 67
W. H. Fluke & Co.....	2 50
J. S. Wylie & Co.....	30 17
Gazette Company.....	1 50
Gas Light Company.....	12 90
Lindsay & Phelps.....	4 13
Harrison's Pharmacy.....	4 55
Egbert, Fidler & Chambers.....	11 75
Charles Parsons' note and interest.....	629 50
F. C. Fahrenkrug.....	2 00
Hastings, White & Fisher	7 20
T. W. McClelland & Co.....	5 45
Balance in bank	659 94
	<hr/> \$2693 72

In addition to the above, there remains a balance of \$112.50 due from the General Fund, as shown by the report of ex-Treasurer Balch for 1882; also unpaid subscriptions to the amount of \$260.

ENDOWMENT FUND.

To balance in General Fund	\$112 50
To balance in bank	659 94

MOUND FUND.

To contributions, viz.:		\$772 44
Geo. H. French.....	\$25 00	
E. P. Lynch.....	15 00	
	<hr/>	\$40 00

By cash paid on mound work, September 13th.....	\$ 8 45	
" expense of Mr. Gass to Joslin	3 45	
" cash in hands of J. Gass.....	16 55	
" W. H. Pratt, October 3d	3 90	
" balance on hand in General Fund.....	7 65	
		<hr/> \$40 00

The probable receipts of the Academy for 1884, from dues at \$3 each, together with membership fees and dues for 1883 yet unpaid, will amount to about \$500, while the expenses will probably not differ greatly from those of 1883.

As the Academy is entirely dependent upon the dues of members for a support, it is very desirable that our membership be increased, and, no doubt, with an earnest effort, sufficient new members can be obtained to place the society on a self-sustaining basis.

PUBLICATION FUND.

On hand January 1st, 1883.....	\$127 07	
Received during the year.....	583 70	
		<hr/> \$710 77
Paid sundry items.....	\$595 65	
Balance on hand in hands of chairman of Publication Committee..	115 12	
		<hr/> \$710 77

For a more detailed account of this fund you are respectfully referred to report of Publication Committee.

LIABILITIES.

The liabilities of the Academy are as follows:

Balance due W. H. Pratt, Curator.....	\$114 99	
J. S. Wylie & Co., for coal.....	17 00	
A. J. Lerch & Bro., stove repairs.....	2 45	
Thompson & Carmichael, copying-cup.....	1 00	
Davenport Gas Light Company, gas.....	4 00	
Harrison's Pharmacy, supplies.....	4 20	
Egbert, Fidler & Chambers.....	10 20	
		<hr/> \$153 84

Respectfully submitted.

C. E. HARRISON, *Treasurer.*

CURATOR'S REPORT.

TO THE DAVENPORT ACADEMY OF NATURAL SCIENCES:

During the past year the accessions to the museum have not been as large as in some previous years, but it has been steadily gaining in every department. The most notable increase has been in the collection of stone pipes from the mounds, Rev. Mr. Gass having placed here fourteen which had been collected by himself and others during the preceding year, and all of which he secured from the different parties who had claims upon them. Captain Hall also added one from a mound at Prairie du Chien, making the total number fifty-eight. Several ancient copper implements have also been received from Captain Hall.

An extended investigation as to the geographical range of this type of pipes, and the sources of the material out of which they are made has been in progress for several years, and is still apparently far from being complete, the result in regard to the latter point especially being as yet unsatisfactory, though with some prospect of reaching a solution.

Over two hundred specimens of the ancient pottery from the southern mounds have also been sent in by Captain Hall. A considerable number of broken and fragmentary specimens have been restored, the whole series registered and labeled, and photographs have been made of ninety of the most important and unique, for the purpose of obtaining wood-cuts, which the Bureau of Ethnology of the Smithsonian Institution offered to furnish free of cost to the Academy, they having the privilege of using them afterward in their publications.

A few of the implements, utensils, and ornaments of the modern Indians have come to hand, but this department is very meagerly represented, and some effort should be made to procure that class of specimens. This might, perhaps, be accomplished by the aid of friends and correspondents residing or traveling in the territories and Pacific states.

No museum cases have been added during the year, and we have not much space for more, except in the basement. It seems very desirable to add there the cases required to complete the alcove arrangement in the west room, and to make the changes necessary to improve the drainage and ventilation and the draft of the furnace, and to finish the south room so that the basement may be utilized to much better advantage than at present.

Suitable provision should by all means be made for the proper care of the valuable entomological collection left in the Academy by our late associate and co-worker, Mr. J. Duncan Putnam, as well as for additions thereto.

I have only to add a few suggestions as to our work in the immediate future. While no opportunity should be omitted to continue the exploration of the mounds—in which, through the persistent zeal of one or two members, we have had so much success hitherto—I would suggest that our efforts to make additions to the museum should be more especially in the direction of local collections—endeavoring to complete the series of fishes, reptiles, birds, and insects of our own neighborhood, as well as perfecting the representation of the geology, palæontology, and mineralogy of this district, thus making our work more especially a home work—a prime duty of every natural science association, and one in which we are deficient.

A carefully conducted local geological survey is not too much for us to undertake, and would be of interest and value as a contribution to the general work in that department, and would redound to the credit of our association.

It seems to me particularly important that all this work should be carried on in connection with lectures and classes for the study of these several subjects, thereby awakening the interest, enlisting the influ-

ence, and uniting and aiding the efforts of all persons among us who are at all inclined to scientific pursuits, and so contributing as much as possible to "the increase and diffusion of scientific knowledge" *at home*.

Respectfully submitted.

W. H. PRATT, *Curator*.

LIBRARIAN'S REPORT.

MR. PRESIDENT AND MEMBERS OF THE ACADEMY:

I have the honor to report that during the year which has just closed 1,780 additions have been made to the library of the Academy, not including files of city dailies donated by their publishers. These additions were by donation or exchange, and represent the reports of the various scientific societies of the world, files of the various scientific journals and periodicals, and a miscellaneous collection of books and pamphlets on almost every subject connected with the natural sciences. The total number of volumes in the library is now 9,239, in addition to which about 900 volumes are deposited in the Academy by members.

With this number of books in our possession, it would seem scarcely necessary to call attention to the fact that additional shelf-room is very much needed. The value of the library would be greatly enhanced, and it would be much more available for reference, if some binding could be done. As a matter of preservation, too, this is important, as some of the most valuable additions to the library are unbound. Of still greater importance is the preparation of a catalogue. The Academy would be of much greater use to the community if the varied and interesting nature of its library could be more generally known, and it could be rendered more available for study.

Some action in each of these directions is urgently demanded, and each year renders the work more onerous.

All of which is respectfully submitted.

JENNIE McCOWEN, M.D., *Librarian*.

CORRESPONDING SECRETARY'S REPORT.

[The Corresponding Secretary made a verbal report.]

RECORDING SECRETARY'S REPORT.

TO THE DAVENPORT ACADEMY OF NATURAL SCIENCES:

The Recording Secretary begs leave to report:

Meetings.—The meetings held during the year 1883 have been as follows: Annual meeting, January 3d; regular meetings of the Academy, 11; adjourned meetings of the Academy, 2; special meetings of the Academy, 1; citizens' meeting to raise funds to pay the debts of the Academy, April 24th; average attendance of the meetings, 12 members and 4 visitors.

Trustees' Meetings.—Regular Trustees' meetings, 3; adjourned Trustees' meetings, 1; special Trustees' meetings, 3; average attendance, 9.

Lectures.—Maj. F. F. Hilder, of St. Louis, on "Egypt," March 21st, 1883; Prof. F. W. Putnam, of Cambridge, on "Altar Mounds," September, 1883; Dr. Radenhausen, of Davenport, on "Aniline Colors," December 28th, 1883. Miss Dr. McCowen has delivered the first two of a course of six free lectures to ladies on Physiology.

An informal class for the study of botany and analysis of plants met at the Academy on Tuesday afternoons, during the summer and fall—usual attendance about 7; a class in zoölogy also met at same place during the fall.

Members.—Regular members elected, 85; corresponding members elected, 19; total number of members elected, 104; members deceased, 2. Eighteen regular members have become life members.

Present Membership.—Regular members, 170; life members, 76; corresponding members, 275.

Visitors.—Paying visitors, 2,277; members, 1,300; visitors by invitation, business calls, etc., 1,734; total, 5,311.

LUCY M. PRATT, *Recording Secretary*.

January 2, 1884.

REPORT OF THE PUBLICATION COMMITTEE—1883.

TO THE PRESIDENT OF THE DAVENPORT ACADEMY OF NATURAL SCIENCES :

The work of the Publication Committee for the past year (1883) comprises the completion of Volume III., which has been in progress since January, 1881. This volume, commenced under the editorial supervision of J. Duncan Putnam, was virtually carried on by him to the day of his death, December 10th, 1881, and the concluding portion, very appropriately commemorating his life-work, completes what is known as the "Memorial Volume." The actual cost of this volume, including 314 pages and 10 plates, has been \$1,381.47. It brings the records of the proceedings down to December 30th, 1881, including the scientific papers presented during this interval and concluding with the posthumous works of its previous editor. The edition of one thousand copies, brought to a completion without debt, was placed at the disposal of the Academy May 25th, 1883, and its distribution since has continued to yield the valuable returns heretofore realized in exchanges of scientific publications from nearly all known societies.

Soon after the completion of this volume the committee took into consideration the propriety of continuing the publication by commencing Volume IV., wishing to bring up to date the record of proceedings and make provision for the publication of scientific papers already presented or promised. This movement took definite form on the reception of a communication, September 6th, from W. H. Holmes, of the Bureau of Ethnology, proposing to furnish engravings of a number of the most interesting archaeological relics in the museum of this Academy under certain very liberal conditions. The acceptance by the Academy of

this proposition necessarily sanctioned the continuance of the publication, and accordingly measures were taken for securing the necessary funds and engaging a publisher. The bids solicited from several responsible parties resulted in giving the contract to C. G. Plummer, and the work was commenced October 26th, 1883. After four forms had been made up, Mr. Plummer was obliged, for personal reasons, to suspend the contract, and it was transferred to Glass & Hoover, who are now carrying on the work as rapidly as the necessary manuscripts can be prepared. The matter so far made up, or in process of publication, includes a complete list of donations to the museum during 1879, 1880, and 1881; a paper on Iowa botany, by J. C. Arthur; and several botanical papers presented by Dr. C. C. Parry. Other matter now awaiting the necessary preparation of manuscript is a condensed record of Academy proceedings from 1882 to 1885, and a complete list of the additions to the library since 1879, to be prepared by the Librarian. The means now on hand for meeting the expenses of this publication comprises \$72.37, in the hands of the committee, and unpaid subscriptions amounting to \$51. All bills thus far accrued have been paid in full. Your committee, in conclusion of their labors, indulge in the hope that the important work of continuing the publication thus auspiciously commenced may be carried on by their successors to a prosperous conclusion.

MRS. M. L. D. PUTNAM,
C. C. PARRY,
W. H. BARRIS,
C. H. PRESTON,
W. H. PRATT,
Committee.

REPORT OF FINANCES OF PUBLICATION COMMITTEE.

Cash on hand January, 1883	\$127 07	
Received during 1883.....	589 70	
	<hr/>	\$716 77
<i>Expenditures.</i>		
Amount paid on Volume III	\$565 05	
Amount paid on Volume IV. for photographs.....	30 60	
Amount paid on Volume IV. for printing three forms.....	48 75	
Amount on hand.....	72 37	
	<hr/>	\$716 77
Uncollected subscriptions....		\$51 00

PRESIDENT'S ANNUAL ADDRESS.

By E. P. LYNCH.

LADIES AND GENTLEMEN:

I regret that my report on the condition of the Academy and its progress during the year for want of time can only be general in character, and that the results do not show sufficient advances in the directions so ably pointed out by my predecessor, Dr. Preston, at the last annual meeting. His report, replete with suggestions tending to increase, in a general way, an interest in scientific studies, also made

special mention of the financial needs of the association, occasioned by rapid growth of our collections and the positive necessity of providing for the interest due on the Academy debt. This matter of indebtedness being most urgent, a committee of the association arranged a citizens meeting in our rooms, at which Mr. George H. French presided and explained to those present the objects of the association, the work done, and its needs, in words so earnest and forcible that the sympathy of all was at once enlisted, and evidenced by generous subscriptions. Messrs. G. H. French, N. Kuhnen, and G. P. McClelland were appointed a committee to complete the work, which had grown under the impressive appeal of the chairman. The responses to their solicitations were so generous that subscriptions to the amount of \$2,945 were received. This sum was sufficient not only to meet current expenses and the interest on the debt, but also to pay all debts and leave about \$1,000 in the treasury as a permanent fund. As shown by the Treasurer's report, a small part of the subscribed money is yet uncollected. This was made necessary by the wish of the subscribers who arranged to pay late in the year. All will shortly be available.

The interest developed by the efforts to relieve the Academy of debt also gave grounds to hope that it might be made self-sustaining. With this end in view, an effort to increase the membership resulted in quite a gain. Estimates, however, on the cost of carrying on the work of the Academy, made it evident that, in addition to a larger membership, it also would be necessary to increase the dues from two dollars to three. This seemed proper for other reasons: the dues had been fixed at an early day, when the Academy collections filled but two cases, and when the association was under but little expense — now the Academy occupies a home of its own; its collections, in some respects, are superior to any others in the country; and, with its rapidly growing museum and library, it has outgrown the expectations of the most sanguine of its projectors. It was thus shown that the provisions for the support of the Academy had not kept pace with its growth, and, after careful consideration, the change in annual dues was made. It is hoped that members of the association not familiar with this change will, when the collector visits them, appreciate its necessity. Surely, if they consider the value of all that has been accomplished, and that the only fixed source of income is from the dues, the result will be an increased interest and prompt payments.

To further enlarge our resources, the Lecture Committee have arranged a course of entertainments, and with great labor obtained subscribers sufficient to warrant the risk. The success of the course is assured, if all members will exert themselves in its behalf. The Lecture Committee have also, through their chairman, Rev. A. M. Judy, arranged a course of five free lectures in our rooms. The Academy and the public are indebted to Dr. Jennie McCowen, who has inaugurated this course by lectures to the ladies on the subject of Physiology. Among the pleasing features of the year were the lectures by Professor Hilder, of St. Louis, and Professor Putnam, of the Peabody Institute.

Aside from the interest attached to these lectures, we may congratulate ourselves in having the friendship of the gentlemen, as the trouble and expense incurred by them in our behalf evidenced. We also had the pleasure of a visit from the Rev. Mr. Gass, who came from his home in the north part of the State to take charge of some mound work, of which limited time prevented the completion.

The demands on the time of the Curator have been constant and arduous—the valuable collections sent us by that veteran collector, Capt. W. P. Hall, alone requiring an amount of time and labor in their arrangement that can be appreciated only by those who have watched the interesting process. In this connection we naturally bring to mind our obligations to Captain Hall, whose disinterested services have placed in our rooms a collection that will always be a source of pleasure and profitable study.

The reports of the Secretary indicate an average attendance.

The Librarian's report shows large and valuable additions, and contains suggestions that merit the attention of the association.

The Treasurer's duties have been unusually exacting, and the Academy is under obligations for their faithful and efficient discharge.

The Publication Committee report the completion of the third volume of the Academy's proceedings. As the work on this volume was completed during the previous year, it should be so credited. This volume will be our most valued one, and well deserves the care given to its production. It would be fitting for me to refer more fully to the work of the Publication Committee, but, when I consider the labor, anxiety, and expense that each volume occasions, words seem idle.

There is yet a matter in connection with the endowment fund subscription unfinished: by vote of the association a subscriber of fifty dollars is entitled to life membership. The matter of life membership certificates should be attended to as early as possible.

At the last regular meeting of the society some changes in the constitution and by-laws were made. With one exception, these changes were of minor importance. The article of the constitution placing money received for life membership to the credit of a building fund was changed so as to place all such money in an endowment fund. The importance of this change and the desirability of increasing this fund admit of no question. It should be the settled policy of the Academy to add to the fund each year, and to so shape its affairs that debt may not be incurred.

While I have but slightly mentioned the work of the association in the direction of its scientific interests, the detailed reports of the Curator and others indicate that progress has been made; and, judging from the active interest shown by the members in their attendance at the meetings, and from the knowledge that the field of labor is practically untouched, I hope for a growth in the future that will equal that of the past. And now, while my term of office has but a few minutes to run, I wish, both as an officer of the Academy and in my individual capacity, to give thanks—first, to the gentlemen of the citizens' meeting who argued so effectually and worked so success-

fully; next, to the citizens who responded so generously; and, finally, to the members of the association for their generous support and considerate attention.

ELECTION OF OFFICERS.

The election of officers for the ensuing year was then held, with the following result:

President — H. C. FULTON.

First Vice-President — JAMES THOMPSON.

Second Vice-President — J. B. PHELPS.

Curator — W. H. PRATT.

Treasurer — W. H. FLUKE.

Librarian — DR. JENNIE MCCOWEN.

Recording Secretary — MISS LUCY M. PRATT.

Corresponding Secretary — W. C. PUTNAM.

Trustees for Three Years — DR. C. C. PARRY, PROF. W. H. BARRIS, J. B. PHELPS, W. H. PRATT.

E. P. Lynch was elected Trustee to fill the vacancy occasioned by the resignation of F. A. Balch, and Dr. C. T. Lindley to fill the vacancy caused by the election of H. C. Fulton as President.

Dr. H. A. Hagen, of Cambridge, Massachusetts, was elected an honorary member.

January 11, 1884. — ADJOURNED MEETING.

President Fulton in the chair; sixteen members present.

Dr. C. C. Parry introduced a resolution that the Academy be open to visitors on Sunday afternoons from two to five o'clock, which, on motion, was unanimously adopted.

The President then made the following appointments of

STANDING COMMITTEES:

Finance — W. H. Fluke, E. P. Lynch, G. H. Hinrichs.

Publication — Mrs. M. L. D. Putnam, Prof. W. H. Barris, Dr. C. C. Parry, Dr. C. H. Preston, James Thompson.

Museum — W. H. Pratt, Prof. D. S. Sheldon, Prof. W. H. Barris, Dr. E. H. Hazen.

Library — Dr. Jennie McCowen, Charles E. Harrison, Rev. A. M. Judy.

Dr. E. H. Hazen then read a paper presenting a plan for a school of instruction in domestic art and cookery.

January 25, 1884. — REGULAR MEETING.

President Fulton in the chair; eighteen members present.

The Curator reported valuable additions to the museum received from Capt. W. P. Hall, from Hale's Point, Tennessee, and Mr. R. S. Lindsay, Alleghany City, Pennsylvania.

The resignation of W. C. Putnam as Corresponding Secretary was received and accepted.

The following persons were elected to regular membership: O. W. Oestlund, Rev. M. L. Williston, Dr. Eugene O. Bardwell, and O. L. Bollinger.

Dr. C. C. Parry presented by title the following paper: "Chorizanthe, R. B.: Revision of the genus, mainly on fruit characters; with a rearrangement of the North American species, from recent observations and collections;" which was received and referred to the Publication Committee.

February 8, 1884. — ADJOURNED MEETING.

President Fulton in the chair; fifteen members present.

The following paper was presented by title: "Contributions to the Flora of Iowa, No. VI.," by J. C. Arthur; which was received and referred to the Publication Committee.

February 29, 1884. — REGULAR MEETING.

President Fulton in the chair; eleven members present.

The Publication Committee reported that, through the entertainment given on the 22d instant, the sum of \$70.30 had been added to the fund.

The Corresponding Secretary read a letter from Dr. W. J. Hoffman, of Washington, D. C., offering for publication in our proceedings a paper entitled "A Synopsis of Linguistic Division of Indian Tribes of the United States and Alaska," by W. J. Hoffman; and, on motion of Dr. Parry, it was voted that the paper be received, read by title, and referred to the Publication Committee.

Dr. C. C. Parry then presented and read a biographical sketch of the distinguished botanist, Dr. George Engelmann, of St. Louis, which was received and referred to the Publication Committee, and ordered published in the daily papers.

OBITUARY NOTICE OF DR. GEORGE ENGELMANN, OF ST. LOUIS.

BY C. C. PARRY.

A little over ten years ago the writer was called on to present before this Academy an obituary notice of one of its honorary members, then the oldest and most distinguished American botanist, Dr. John Torrey, of New York City. Now the sorrowful duty again devolves on me to notice the recent decease of another shining light of American botanical science, still nearer home. Dr. George Engelmann, of St. Louis, Missouri, a corresponding member of this Academy, died at his residence on the 4th instant, just two days after reaching his seventy-fifth year.

Born in Frankfort-on-the-Main, Germany, in 1809, he completed his medical and scientific studies, part of the time as an associate of Agassiz and Braun, soon after coming to this country, and finally settling in St. Louis. Here, in this rapidly growing western town, he took up the engrossing duties of medical practice, devoting only his scant leisure hours to a study of the plants of the adjoining district. As the far western regions became open to exploration, his examinations extended over the entire region to the Pacific coast. While not till a late day an extensive traveler, his retired office at St. Louis became the point of rendezvous to which most government explorers resorted to obtain the most reliable information, to compare barometers, and on their return to deposit some of the botanical results of their explorations. Later still, numerous correspondents, attracted by his growing reputation, availed themselves of his extensive and accurate knowledge of western American botany, to send botanical specimens to him for determination and study. His valuable suggestions, his pertinent inquiries, and his instructive explanations, never failed to awaken a deeper interest in the subject and incite a more intelligent zeal in all thus brought into friendly contact.

As an early correspondent of Dr. Torrey and Professor Gray, he was soon engaged as a collaborator in some of the more difficult natural orders of American plants. His published papers (of late mainly contributed to the proceedings of St. Louis Academy of Science) were models of accuracy, thoroughness, and systematic order. Whatever he took in hand was mastered in all its details, and, as far as possible, exhaustively worked out. His special delight was in unraveling the most difficult and imperfectly known classes of plants. In this way he took up the parasitic dodders, the forbidding spiney cactuses, the aquatic rushes, the century plants, and the pines and oaks; his elucidation of all these being largely assisted by his skillful pencil. While cautiously non-committal on doubtful or imperfectly known points, on subjects that he had carefully examined his authority was unquestioned, and he rarely made mistakes, or in such occasional instances was ever ready to make the needful correction. He disliked, above all things, a vague indefiniteness of description, avoiding himself, and severely criticising in others, the use of such terms as *somewhat*, *nearly*, *almost*, etc. In fact, for all shams, scientific or otherwise, he had an instinctive abhorrence. In his

social characteristics, though naturally unobtrusive and undemonstrative, he was singularly warm-hearted, and cheerful even to jocularity.

Since my first personal acquaintance with him, in 1848, when I called on him at St. Louis before starting on my first exploring trip with Dr. D. D. Owen, in the then North-west, our friendly intercourse has been constant, and the letters received from him would make up a respectable volume. How much I owe to his wise counsels, his substantial encouragement, and not less to his sharp criticisms (always well meant), I can now best realize by feeling their loss.

Ten years ago I had the pleasure of accompanying him on his first trip to the Rocky Mountains, where I had preceded him as an explorer, but not as a *knower*; in fact, he was the first one to show me how to look at things *instructively* (to use a favorite term of his). It was at this time he was brought into familiar intercourse with our late lamented associate, J. Duncan Putnam, who was then suffering from the first attacks of that insidious disease that eventually brought his promising life to an untimely end. A characteristic incident, related to me by young Putnam, will help to show some of the peculiar traits of our mutual friend. It was while the two were awaiting my arrival at their Rocky Mountain rendezvous. At my suggestion, Dr. Engelmann was directed to a locality where, near his hotel, he could observe the growth and development of the pine mistletoe (*Arceuthobium*), which he had previously studied only from dry specimens. Selecting there a tree abundantly garnished with this curious parasite, he sat down under its shade to study it in his own thorough way. As young Putnam remarked, he hardly took time to eat or sleep for three days till he had mastered all its details, and was so wrapped up in his subject that his answer to all common questions was, "*Arceuthobium!*" Pointing out to his companion some of its peculiarities, he would break out occasionally with the petulant remark, "Why did they not tell me this (or that) before." Ah, the answer to that pregnant question would not be hard to express to that now closed ear—viz., that it needed the eye of a *master*, and not of a *novice*, to know just what to observe. Just here was the true secret of his power as a botanical investigator—he knew just what to look for, and, when seen, he also knew its significance, in elucidating the system of nature.

Not to linger on these pleasant reminiscences, which it is to be hoped some abler biographer will bring together, to illustrate the character of the man and the student of nature, I must come down to a still later date, when he had passed his three-score years and ten. He had hardly recovered from the shock of losing his life companion when he was persuaded to undertake a trip to the Pacific coast, in company with Prof. C. S. Sargent and the writer, in 1880. On this memorable occasion, how deeply interesting to note the fresh light of manly vigor shining out of those experienced eyes as he looked for the first time upon scenes that he had so long thought over, gathering with his own hand the fruits of oak or pine that he had before only studied in the dried mummies of the herbarium! To watch the instructive processes by which he arrived at scientific results, to see the enthusiasm brightening up as

he reached the solution of some deep botanical problem, was in itself a profound study, and will ever remain as a most cherished recollection.

Still, in the midst of all the wearisome pleasure and excitement of travel, his thoughts often turned toward his quiet home, or, as he chose to express it, he longed for *solid work* — to put the results of his observations into systematic form, which could only be done in the retiracy of the closet. So, leaving the Pacific coast, he returned to St. Louis to work up his collections and field-notes — not altogether satisfactorily, however, for a severe winter aggravated a rheumatic affection, which afterward developed symptoms of serious heart disease. Struggling manfully in the midst of these infirmities, he still laid out large plans for future work. Only last season he again visited, for the last time, his native land, returning late in the season, considerably revived. Spending his last winter quietly at home, he sits down to his accustomed desk, on the 2d of February, his seventy-fifth birthday, pens a characteristic letter to me, his old-time friend, signs and directs it, goes up to his room, not to leave it till he takes his last unreturning journey, February 4th, 1884.

March 28, 1884. — REGULAR MEETING.

President Fulton in the chair; seven members present.

Mr. W. H. Pratt called attention to the injurious legislation now pending in Congress affecting the value of patents and the rights of inventors, and suggested that the Academy adopt resolutions, to be communicated to our member of Congress, remonstrating against such legislation. On motion, Messrs. W. H. Pratt, C. E. Harrison, and James Thompson were appointed a committee to prepare and report thereon at an adjourned meeting.

Mr. F. B. Badt then delivered an address upon recent discoveries in electricity, relating especially to the electric light and electric transmission of power.

April 4, 1884. — ADJOURNED MEETING.

President Fulton in the chair; six members present.

Mr. W. H. Pratt, chairman of the special committee to whom was referred the matter of pending congressional legislation relating to patents and the rights of inventors, reported the following, which were unanimously adopted:

WHEREAS, All experience has shown that one of the very important elements in the progress of a nation and the development of its resources is the wise and liberal encouragement of mechanical invention and practical scientific discovery, promoting improvement in manufacturing processes, in means of transportation with greater public safety, and in the establishment of new and important industries; and,

WHEREAS, Now, while other nations, recognizing the wisdom, justice, and expediency of liberal legislation to protect and encourage invention and research, are fast adopting the course which has so long been in successful operation in the United States, and at a time, too, when increased effort is necessary to keep pace with the progress of the age, numerous bills have been presented in Congress, several of which have already passed the House of Representatives, calculated to impair the rights of inventors in the products of their own industry and research, and to discourage all effort in that direction; therefore,

Resolved, That we respectfully and earnestly request our honorable Senators and Representatives in Congress to use their best endeavors to prevent the repeal of the existing guarantees, or the enactment of any laws obstructing the inventor's control of his inventions or the defence of his rights therein, and destroying the value of that which is legitimately his own property, or for shortening the period of the existence of a patent, taking away his prospect of pecuniary compensation for work in the highest degree beneficial to the community and contributing largely to the prosperity of the nation, and discouraging the exercise of talent and means in that direction.

Resolved, That these resolutions be published in the daily papers, and copies forwarded to the Senators from Iowa and the Representative from this district.

April 24, 1884.—REGULAR MEETING.

President Fulton in the chair; seventeen members and seven visitors present.

The Curator reported valuable donations to the museum from Capt. W. P. Hall, Dr. C. C. Parry, Mr. A. E. Smenner, and Mr. Chris. Benedix.

The Lecture Committee presented a report upon the course of lectures and entertainments given under the auspices of the Academy during the past winter and spring, showing net proceeds to the amount of \$247.42.

On motion of Dr. C. C. Parry, the special thanks of the Academy were tendered Major J. W. Powell for his courtesy in lecturing, free of charge, for its benefit.

Mr. A. S. Tiffany read a portion of a paper on the geology of Scott County, and, for want of time to complete it, the reading of the remainder was deferred until the next meeting.

Mrs. Putnam reported that the net proceeds from the exhibition of water-color paintings, for the benefit of the publication fund, amounted to \$70.30, and moved that the thanks of the Academy be tendered to Mrs. A. C. Willis for the loan of her fine collection of paintings.

May 30, 1884.—REGULAR MEETING.

President Fulton in the chair; seven members present.

The Curator called attention to some interesting peculiarities in several of the Flathead skulls from the Arkansas mounds received during the past month. In one of them is found a large "Inca bone," formed by the presence of a horizontal occipital suture in addition to those usually present; and in another the ear openings are nearly closed by the bones growing into them. He also exhibited a number of "ossicles," minute bones of the internal structure of the ear, which had been extracted in cleaning out the earth which filled the cavities.

The "honey-dew," which has been observed in such remarkable profusion this year, and the various opinions regarding the origin and nature of the substance, came up for discussion. The observations of several members strongly supported the theory that it is produced by the "bark-louse," *Pulvinaria innumerabilis*, these insects being present in unprecedented numbers.*

June 28, 1884.—REGULAR MEETING.

President Fulton in the chair; six members present.

Reports of officers were presented.

Mr. M. M. Knapp was elected to regular membership.

Donations were reported from Mrs. Col. Latham, Mrs. A. C. Willis, Rev. J. Gass, and Capt. W. P. Hall.

August 29, 1884.—REGULAR MEETING.

President Fulton in the chair; seven members present.

Attention was called to an article by Henry W. Henshaw, published in the second annual report of the Bureau of Ethnology, entitled "Animal Carvings from Mounds in the Mississippi Valley," wherein the authenticity of the inscribed tablets and elephant pipes is assailed, and the honesty of the discoverers called in question. After considerable discussion, the paper of Mr. Henshaw was referred to a special committee, consisting of H. C. Fulton, Dr. C. H. Preston, and James Thompson, to consider the same and report thereon.

The Academy then adjourned to meet on Saturday evening, August 30th, for the reception of Prof. William H. Holmes, of Washington, D. C., who was in the city and desired to select specimens of our pottery for illustration.

* This conclusion was reached, after an elaborate discussion, by the late J. Duncan Putnam, in a paper upon "*Pulvinaria Innumerabilis*," published in the Proceedings, Vol. II., p. 325.

August 30, 1884.—ADJOURNED MEETING.

President Fulton in the chair; a large number present.

The Curator reported the donation of three boxes and one barrel of mound relics, from Arkansas, by Capt. W. P. Hall; also a small collection recently made by himself on the site of an ancient "Mandan town," or settlement, about one mile below the present town of Le Beau, Walworth County, Dakota, situated on the second terrace above the Missouri River, and about a quarter of a mile distant from its banks. The articles consisted of small, finely-worked flint and agate implements, a few pieces of worked bone, and numerous flakes and fragments of flint and moss-agates.

Prof. William H. Holmes, of Washington, D. C., being present, entertained the meeting with interesting remarks upon the ceramic art in North America in prehistoric times, as shown by the specimens in the collections at Washington, Davenport, and elsewhere.

September 7, 1884.—SPECIAL MEETING.

President Fulton in the chair; six members present.

The decease of Dr. R. J. Farquharson was announced, and, on motion, a committee on resolutions was appointed, consisting of James Thompson, C. E. Harrison, and Dr. C. H. Preston, to report at a future meeting. This committee was instructed to request Dr. W. D. Middleton to prepare a biographical sketch of Dr. Farquharson for publication in the Academy proceedings.

The following message was drawn up for immediate transmission by telegraph:

TO MRS. LYDIA FARQUHARSON AND FAMILY, *Des Moines, Iowa*:

The Academy of Sciences, in special meeting assembled, extends to you its condolence and sympathy in your present great bereavement, fully recognizing our irreparable loss, and that of the scientific world.

H. C. FULTON, *President*.

W. H. PRATT, *Cor. Secretary*.

September 16, 1884.—SPECIAL MEETING.

President Fulton in the chair; ten members present.

The President, H. C. Fulton, stated the object of the meeting to be the reception of a report from the special committee appointed at the regular meeting, August 29th, to consider the matter of Mr. Henshaw's article in the second report of the Bureau of Ethnology, reflecting upon the archæological collections and collectors of the Davenport Academy;

and he further stated that, inasmuch as that committee, in making up their report, had consulted with various other members of the Academy, it was therefore thought advisable to add them to the committee, and he accordingly formally placed the following persons on that committee: Prof. D. S. Sheldon, Prof. W. H. Barris, William Riepe, C. E. Harrison, E. P. Lynch, and W. H. Pratt.

This committee thereupon, through its chairman, Mr. Fulton, reported, in substance, that they had carefully considered the statements made by Mr. Henshaw in his paper entitled "Animal Carvings from Mounds in the Mississippi Valley," and had unanimously arrived at the conclusion, and so recommend, that its insinuations and slanders should be met by a prompt denial and refutation, and that the answer thereto should be published and widely distributed throughout the scientific world.

On motion of Dr. Preston, the report was received and the committee discharged.

It was thereupon moved by Mr. Pratt, that the report and recommendation of the committee be adopted, which was decided in the affirmative by a unanimous vote.

September 26, 1884.—REGULAR MEETING.

President Fulton in the chair; thirteen members present.

Dr. Preston presented the report of the committee on resolutions on the death of Dr. Farquharson, as follows:

WHEREAS, The hand of death has claimed our late honored and esteemed associate, Dr. R. J. Farquharson:

Resolved, That in the removal of one of his ripe scholarship and sterling worth, an irreparable loss has been sustained, not only by his family and the whole circle of sorrowing friends, but by this association, which, as such, is so deeply indebted to his labors and influence, both at home and abroad; by the commonwealth of Iowa, which he served so ably as Secretary of the Board of Health; and by the scientific world at large, in which his name is so widely known and respected.

Resolved, That we hereby testify our appreciation of the worth and express our sorrow and regret for the loss of one who has honored the Academy by filling its most honorable offices.

Resolved, That we tender our heartfelt sympathy to the bereaved family, to whom and to the city papers of Davenport and Des Moines the Secretary is instructed to transmit copies of these resolutions.

Which resolutions, on motion, were unanimously adopted.

Mr. Robert Poynter, of Poynter, Arkansas, was elected a corresponding member.

Mr. H. A. Pilsbry made a verbal report of the discovery of some species of aquatic mollusks new to this locality.

October 31, 1884. — REGULAR MEETING.

Vice-President Thompson in the chair; fifteen members present.

On motion of Mr. Judy, it was resolved that a committee be appointed to prepare a paper setting forth the evidence of the genuineness of the pipes and tablets, and replying to Mr. Henshaw's paper, which motion was adopted. It was then moved that the Publication Committee act as such committee, which was carried.

The following persons were enrolled as life members: E. S. Carl, G. W. Cable, J. H. Murphy, Isaac Rothschild, R. Smetham, George H. French, Robert T. French, N. Kuhnen, and N. Kuhnen, Jr.

November 28, 1884. — REGULAR MEETING.

President Fulton in the chair; ten members present.

Mr. Pilsbry said that he had been requested to inform the meeting that the large water-color painting shown had been presented to the Academy, and offered the following resolution:

Resolved, That the Academy tender to Mr. Brandt a vote of thanks for his donation of a fine water-color painting.

On motion of Dr. C. T. Lindley, the following committee was appointed to arrange for commemoration addresses on the occasion of the anniversary of Dr. Samuel Johnson: Gustav Koch, H. C. Fulton, Dr. C. T. Lindley, Miss Phoebe W. Sudlow, Dr. Jennie McCowen, and James Thompson.

December 26, 1884. — REGULAR MEETING.

President Fulton in the chair; nine members present.

The chairman reported; on behalf of the committee on Johnson's anniversary meeting, that the meeting was held, as proposed, on the evening of the 13th instant, and well-prepared and interesting papers were read by Rev. M. L. Williston, W. J. Birchard, James Thompson, H. C. Fulton, and Dr. Jennie McCowen, and selections were read by Miss Richardson.

Mr. Walter C. Wyman, of Chicago, and Miss Alice Sieg, of Davenport, were elected to regular membership, and the latter enrolled as a life member.

The following papers were read by title and referred to the Publication Committee: "Pictographs and Tattooing in California and Queen

Charlotte's Island," by W. J. Hoffman; "Mound Explorations in the North-eastern Part of Iowa," by Rev. J. Gass; "Notes on the Loess of Davenport and Vicinity," by H. A. Pilsbry; "Remarks on the Anatomy of Certain Fresh-water Snails," by H. A. Pilsbry.

The Publication Committee, of whom Dr. C. H. Preston and Mr. James Thompson were present, reported that a paper in reply to Mr. Henshaw had been prepared and submitted to them by Mr. C. E. Putnam, and that it was approved by them and recommended for publication.

On motion, it was voted that the report be received. Dr. Preston then read the paper, and moved that it be referred to the Publication Committee, with instructions to publish, with such revision as the author may see fit to make; which motion was adopted.

The paper prepared by Mr. Putnam was entitled "Elephant Pipes in the Museum of the Academy of Natural Sciences, Davenport, Iowa," and was a vindication of the authenticity of these relics from the accusations of the Bureau of Ethnology of the Smithsonian Institution. This paper was printed in pamphlet form and widely distributed, and a revised edition of it is now republished in an appendix to this volume, together with selections from the extensive correspondence elicited by this important discussion.

APPENDIX.

DAVENPORT, IOWA, February 6th, 1885.

At the regular monthly meeting of the Davenport Academy of Natural Sciences, held on Friday evening, January 30th, 1885, Dr. C. H. Preston offered the following resolutions, which were unanimously adopted:

WHEREAS, The Second Annual Report of the United States Bureau of Ethnology contains an unjust and gratuitous attack upon the honor and good faith of this Academy and some of its members, calling in question the genuineness of certain articles in its museum; and,

WHEREAS, Such attacks must tend to impair and destroy the usefulness of such collections and to discourage earnest and faithful workers in their disinterested labors; therefore,

Resolved, That justice and the interests of science imperatively demand a complete refutation of these charges, and vindication of the character of the parties attacked, and especially of our honored associate, Rev. J. Gass; and,

Resolved, That the following paper, prepared by Mr. C. E. Putnam, and, as we are fully satisfied, representing the whole matter in all truth and fairness, be adopted as our reply to the article in question; and,

Resolved, That ——— copies of said paper be published immediately, under the direction of the Academy Publication Committee, in pamphlet form, corresponding with the Proceedings, and that the same be distributed, as far as possible, to parties who receive the above-mentioned Report of the Bureau of Ethnology, and to all known archaeological associations, and to individual collectors and explorers, and to all publishers and writers on the subject, and that a record be kept of all parties to whom it has been sent.

The above resolutions are correctly transcribed from the records of the Academy, and the same will appear in Volume V. of its published Proceedings.

L. M. PRATT, *Recording Secretary*.

ELEPHANT PIPES

AND

INSCRIBED TABLETS

IN THE MUSEUM OF THE

ACADEMY OF NATURAL SCIENCES

• DAVENPORT, IOWA.

BY

CHARLES E. PUTNAM,

PRESIDENT OF THE DAVENPORT ACADEMY OF NATURAL SCIENCES.



DAVENPORT, IOWA:

GLASS & HOOVER, PRINTERS AND BINDERS.

1885.

PREFATORY NOTE.

The following vindication of the authenticity of the elephant pipes and inscribed tablets in the museum of the Davenport Academy of Natural Sciences from the accusations of the Bureau of Ethnology of the Smithsonian Institution was prepared in response to an earnest feeling entertained by members of the Davenport Academy of Natural Sciences, and in its preparation the writer has had their hearty coöperation and active assistance. Especial acknowledgments are due to Mr. William H. Pratt, the Curator and Corresponding Secretary of the Academy, whose extensive researches in archæology enabled him to furnish much valuable material for incorporation in this paper; to Rev. A. M. Judy, Mr. James Thompson, and Dr. C. H. Preston, who, as a special committee on behalf of the Academy, thoroughly investigated all the circumstances connected with the transactions in question, and freely placed at the disposal of the writer the results of their investigation; and to our honored associates, Prof. D. S. Sheldon and Rev. W. H. Barris, of Griswold College, who carefully reviewed the paper and favored the writer with excellent suggestions. An expression of grateful appreciation is also due to those correspondents, in various parts of the country, who, in strong terms, have expressed their condemnation of the unjustifiable attack made upon the Academy by the United States Bureau of Ethnology; and, in entering upon the preparation of this vindication, the writer has derived great encouragement from the hearty assurances of approbation and support received from these eminent archæologists.

C. E. P.

DAVENPORT, IOWA, February 9th, 1885.

ELEPHANT PIPES AND INSCRIBED TABLETS.

BY CHARLES E. PUTNAM.

In the sharp controversy now being waged among archæologists, as to the origin of the Mound-builders, the Bureau of Ethnology connected with the Smithsonian Institution has taken decided position as the champion of the theory that this mysterious race can be traced with comparative certainty to the ancestors of our American Indians. In the first annual report of the Bureau, Major Powell, its accomplished Director, thus emphatically states its position upon this question :

“With regard to the mounds so widely scattered between the two oceans, it may also be said that mound-building tribes were known in the early history of the discovery of this continent, and that vestiges of art discovered do not excel in any respect the arts of Indian tribes known to history. There is, therefore, no reason for us to search for an extralimital origin, through lost tribes, for the arts discovered in the mounds of North America. The tracing of the origin of these arts to the ancestors of known tribes, or stocks of tribes, is more legitimate.” *

At a subsequent date, Major Powell, in giving his assent to the theory “that the Mound-builders were no other than the Indian tribes found in the country in post-Columbian times, and their ancestors,” makes use of this strong language :

“There has never been presented one item of evidence that the Mound-builders were a people of culture superior to that of the tribes that inhabited the valley of the Mississippi a hundred years ago. The evidence is complete that these tribes have built mounds within the historic period; and no mounds or earth-works have been discovered superior in structure or contents to those known to have been built in historic times. The theory that the country was inhabited by a people highly organized as nations, and having arts of a higher grade than those belonging to tribal society, is wild and baseless, and the fruit of that theory is nothing but exaggeration and false statement.” †

The theory thus boldly announced is also vigorously maintained by Prof. Cyrus Thomas, Director of the archæological explorations of the Bureau of Ethnology, who recently expressed these views :

* First Annual Report of the Bureau of Ethnology, Washington, 1879-80, p. 74.

† *Science* for April 3d, 1885, p. 267.

"Excluding such remains as are due to Europeans, and are post-Columbian, I hold that all the ancient artificial works found in the Mississippi Valley and Gulf States are to be attributed to the Indians found in this country at the time of the discovery and their ancestors. By this limitation of the term 'Indians' I exclude the Toltec, Aztec, and other civilized people of Mexico and Central America."*

The position thus assumed by Major Powell, and maintained by Prof. Thomas, finds recent and strong support in William H. Dall, an honorary Curator of the National Museum, who, in his edition of Marquis De Nadaillac's "Prehistoric America," just issued from the American press, thus states his conclusions upon this interesting question :

"In closing this chapter, what, it may be asked, are we to believe was the character of the race to which, for the purpose of clearness, we have for the time being applied the term 'Mound-builder?' The answer must be, they were no more nor less than the immediate predecessors, in blood and culture, of the Indians described by De Soto's chronicler and other early explorers—the Indians who inhabited the region of the mounds at the time of the discovery by civilized men."†

The remarkable unanimity among these gentlemen, in their expressions of opinion, clearly indicates concerted action, and a settled policy in the management of this department of the Smithsonian Institution, to force this peculiar theory upon the attention and secure its acceptance by the scientific world.

Another class of archaeologists as strongly maintain the opposite theory, that the Mound-builders were more advanced in civilization than the American Indian, and hence have endeavored to trace them to a Mexican origin, or to some earlier common ancestry. The leadership on this side must be accorded to Messrs. Squier and Davis, who, in their great work upon "Ancient Monuments of the Mississippi Valley," thus state their conclusions :

"Without undertaking to point out the affinities, or to indicate the probable origin of the builders of the western monuments, and the cause of their final disappearance, we may venture to suggest that the facts so far collected point to a connection, more or less intimate, between the race of the mounds and the semi-civilized nations which formerly had their seats among the sierras of Mexico and Peru, and who erected the imposing structures which, from their number, vastness, and mysterious significance, invest the central portion of the continent with an interest no less absorbing than that which attaches to the Nile. These nations alone, of all found in possession of the continent by the European discoverers, were essentially stationary and agricultural in their habits—conditions indispensable to large populations, to fixedness of institutions, and to any considerable advance in

* *American Antiquarian*, March, 1885, p. 65.

† "Prehistoric America," by Marquis De Nadaillac, p. 130.

the economic or ennobling arts. That the Mound-builders, although perhaps in a less degree, were also stationary and agricultural, clearly appears from a variety of facts and circumstances, most of which will no doubt recur to the mind of the reader." *

The position thus assumed by Squier and Davis was supported by Prof. J. W. Foster, a recognized authority upon all archaeological questions, who, in his valuable work, made this emphatic statement of his views with regard to the American Indian :

"He was never known voluntarily to engage in an enterprise requiring methodical labor; he dwells in temporary and movable habitations; he follows the game in their migrations; he imposes the drudgery of life upon his squaw; he takes no heed for the future. To suppose that such a race threw up the strong line of circumvallations and the symmetrical mounds which crown so many of our river terraces, is as preposterous, almost, as to suppose that they built the pyramids of Egypt." †

So, also, Lewis H. Morgan, in a series of most admirable papers, expressed the opinion that the Mound-builders were derived from the Village-Indians of New Mexico, and advanced strong reason in support of his conclusions, and, in the course of his discussion, remarked —

"From the absence of all traditionary knowledge of the Mound-builders among the tribes east of the Mississippi, an inference arises that the period of their occupation was ancient. Their withdrawal was probably gradual, and completed before the advent of the ancestors of the present tribes or simultaneously with their arrival." ‡

And in a careful and profound examination of this question from a different stand-point, Prof. Alexander Winchell arrived at this conclusion :

"After the personal comparison of Peruvian with authentic Mound-builders' skulls from Michigan and Indiana, and others from dolmens and mounds in Central Tennessee, I feel confident that the identity of the race of the Mound-builders with the race of Anahuac and Peru will become fully recognized." §

In the light of subsequent researches, a more recent statement was made by Prof. F. W. Putnam, of the Peabody Museum, at the British Association during its session at Montreal, which seems to strongly confirm the early conclusions of Squier and Davis. At this meeting Prof.

* Smithsonian Contributions to Knowledge, Vol. I., p. 301.

† Prehistoric Races of the United States, p. 300.

‡ Johnson's Cyclopedia, title, "Architecture of the American Aborigines." "Montezuma's Dinner," *North American Review*, April, 1876. "Homes of the Mound-Builders," *North American Review*, July, 1876. Major Powell well said of Mr. Morgan that he was "the pioneer of American anthropology, and recognized throughout the world as a leader in that science." (Annual Report of the Bureau of Ethnology, 1880-81, p. 18, Introductory.)

§ "Pre-Adamites," by Alexander Winchell, pp. 339, 340.

Putnam gave an interesting account of discoveries made in a group of mounds in Hamilton County, Ohio, and his conclusions were subsequently reported in *Science*, as follows:

"These relics seem to show a more complex social life, more abundant and varied artistic products, and a higher status altogether, than can be deemed consistent with the views of those who hold that these Mound-builders were merely the ancestors of our present Indians, and in the same state of culture." *

An abstract of another paper by Prof. Putnam, presented before the American Association for the Advancement of Science at its recent meeting in Philadelphia, was also published in *Science*, wherein an account is given of his explorations of a group of mounds in Madisonville, Ohio, and it is stated that, "as a result, one of the most remarkable series of objects ever discovered in America had been obtained:"

"Among the objects taken from the largest mound of the group were the following, some of them never found before in mounds: Shell-beads, disks, and rings, which were obtained in thousands; cones cut from alligator teeth; ornaments cut from plates of buffalo horn, mica, and native copper, and even gold and meteoric iron; pearls, most of them pierced and injured by heat (not less than fifty thousand were found); small stone dishes, beautifully carved to represent some animal form; and last, and perhaps most important, terra-cotta figurines of exceedingly artistic form, and strangely Egyptian in character." †

A peculiar interest attaches to these statements of Prof. Putnam, not only on account of his acknowledged ability as an archaeologist, but because he formerly entertained the opinion that the Mound-builders were merely the ancestors of our present Indians, and now, through these discoveries, he has been compelled to reconsider the question, and apparently to reverse his conclusions.

The citations we have made are far from exhaustive, but are sufficiently extensive to fairly represent in clear contrast the conflicting theories entertained by these contending archaeologists.

The Davenport Academy, though eagerly engaged in archaeological work, has adopted no theories with reference to the Mound-builders, and takes no part in this controversy. It is considered that deductions so important should have a broader basis of fact; and hence decision upon this interesting question has been postponed while awaiting further discoveries. Its conservative position is well stated by its late Corresponding Secretary, Joseph Duncan Putnam, in a letter to Rev. Dr. Peet, of the *Antiquarian*, bearing date October 10th, 1878:

* *Science* for September 26th, 1884.

† *Science* for October 3d, 1884.

"I am, of course, only an outsider, and look upon the workers in the field of archæology from over the fence; still I am so close that I feel like offering a suggestion occasionally, and I do wish you archæologists could introduce some scientific methods into so interesting a study, gather up the facts, arrange them systematically, and then deduce the theories. But this is an age of speculation, and even in entomology there is a strong tendency to get up a theory and then hunt for facts to support it."

And in a subsequent letter to the same gentleman, Mr. Putnam thus explicitly states the position of the Academy upon the questions raised by the discovery of its inscribed tablets:

"Whether they are modern Indian, or Mound-builder, or Mexican, or European, or post-Columbian, or ante-Columbian — whether the characters are phonetic, symbolic, hieroglyphic, or meaningless — is yet to be decided; we have no means of knowing."

And in looking over the many statements made by Mr. Gass, the principal discoverer of these relics, as published in the Proceedings of the Academy, it will be found that they contain no suggestion of a theory. On the contrary, in giving a description of some inscribed rocks in Cleona Township, Scott County, Iowa, he thus states his own position upon these mooted questions:

"But for what purpose the people selected them, by what intention they were guided, with what kind of tools the inscriptions on such hard material were made, by what nation the engraving was executed — Indian or Mound-builder — these are questions which I do not venture to answer."*

In these utterances on behalf of the Academy will be found the language, not of the champions of a theory, but of earnest seekers after truth.

That the theory advanced by the Bureau of Ethnology as to the origin of the Mound-builders should be maintained with consummate ability, was to be expected of the able and accomplished scholars enlisted in its service. It is, however, to be regretted that, actuated by intemperate zeal to establish this theory, its promoters have sometimes abandoned scientific methods, indulged in hasty generalizations, and even violated the amenities of literature. It will be found that the second annual report of the Bureau of Ethnology, recently issued under the auspices of the Smithsonian Institution, is open to this criticism. In that report there appears a monograph by Henry W. Henshaw, entitled "Animal Carvings from Mounds in the Mississippi Valley,"† and therein an attack of no ordinary severity is made upon

*Proceedings of Davenport Academy of Natural Sciences, Vol. II., p. 173.

†Second Annual Report of the Bureau of Ethnology, Washington, 1880-81, p. 152.

the Davenport Academy of Natural Sciences. In this bitter assault Mr. Henshaw is ably supported by the strong endorsement of Major J. W. Powell, the Director of the Bureau. The Smithsonian Institution occupies a commanding position in the world of science; and, inasmuch as it has given special attention to researches in archæology, it may properly be considered entitled to speak with authority upon these questions. Its sharp criticism, therefore, presents to our Academy a conspicuous opportunity for a careful review of the circumstances, and a plain restatement of the facts establishing, beyond reasonable doubt, the genuineness of its valuable discoveries. °

In the line of archæology the Davenport Academy has attained deserved eminence. Its inscribed tablets, elephant pipes, cloth-covered copper axes, and rare collection of ancient pottery have attracted the attention of archæologists throughout the world of science. These remarkable relics, received with enthusiasm by antiquarians, are generally accepted as authentic additions to the "unwritten history" of the past. That discoveries so rare and unique should be subjected to severe scrutiny might reasonably be expected; and, when exercised in the spirit of an earnest quest of truth, it was even to be desired. Discoveries which are to become the foundations for important historical deductions should be securely intrenched, beyond the reach of adverse criticism, on the bed-rock of truth. These valuable contributions to the science of archæology have undoubtedly given the Davenport Academy a conspicuous position. The assumed fact, emphasized by Mr. Henshaw, that "it has fallen to the good fortune of no one else to find anything conveying the most distant suggestion of the mastodon," is found to be even embarrassing, inasmuch as it places our Academy in the range of fire between contending archæologists. It is certainly a misfortune of the Davenport Academy that the museum of the Smithsonian Institution contains neither elephant pipes nor inscribed tablets.

The discoveries in question are two elephant pipes and three inscribed tablets. Of the latter, the first two were found in what is known as Mound No. 3, on the Cook farm, adjoining the city of Davenport. The principal discoverer was Rev. Jacob Gass, a Lutheran clergyman, then settled over a congregation in Davenport. In this exploration Mr. Gass was assisted by L. H. Willrodt and H. S. Stoltzenau, with five other persons who were accidentally present during the opening of the mound. The discovery was made on January 10th, 1877. An exact and careful statement of the facts connected therewith was soon after prepared by Rev. Mr. Gass, and read at an early meeting

of the Davenport Academy. It was published, and may be found in its "Proceedings."* Upon the announcement of the discovery, the officers and many members of the Academy were early on the ground to verify the statements made by the discoverers. The gentlemen engaged in the exploration are well known, and held in high esteem; their testimony as to all essential facts is clear and convincing, and the circumstances narrated seem to fully establish the genuineness of these relics. That their statement contains only facts, all who know them will not question; and that the mound from which the relics were obtained had not been previously disturbed, is sufficiently established by their testimony. The authenticity of this discovery must therefore be conceded by every fair-minded inquirer.

The third inscribed tablet was found on January 30th, 1878, in Mound No. 11, in the group of mounds on Cook's farm, in the suburbs of Davenport, and in close proximity to the mound wherein the other tablets were discovered. That indefatigable explorer, Rev. J. Gass, was also present during these further researches, and had for his assistants John Hume and Charles E. Harrison, both members of the Academy, and well and favorably known in this community. The circumstances of this discovery, as narrated by Mr. Harrison, are published in the Proceedings of the Academy.† No suspicions whatever attach to this discovery, and the well-attested facts connected therewith establish, beyond reasonable doubt, that, whether more or less ancient, the tablet was deposited at the making of the mound.

Of the elephant pipes in the museum of the Academy, one was discovered in March, 1880, in a mound on the farm of Mr. P. Hass, in Louisa County, Iowa, by Rev. A. Blumer, a Lutheran clergyman from a neighboring city, and was by him donated to the Academy. Rev. J. Gass, Mr. F. Hass, and a number of workmen were present, assisting in the exploration. A detailed account of the finding, prepared by Rev. Mr. Blumer, is published in the Proceedings of the Academy.‡ From the social standing and high character of the principal discoverers, no question has been, or can be, successfully raised as to the authenticity of this discovery. The other elephant pipe was not "discovered" by Rev. J. Gass, as stated by Mr. Henshaw, but was obtained by him from a farmer in Louisa County, Iowa.§ This

*Proceedings of Davenport Academy of Natural Sciences, Vol. II., p. 95.

†Proceedings of Davenport Academy of Natural Sciences, Vol. II., p. 221. Mr. Harrison is now Vice-President of the Academy.

‡Proceedings of Davenport Academy of Natural Sciences, Vol. III., p. 132.

§ Proceedings of Davenport Academy of Natural Sciences, Vol. II., p. 349, note.

man found it while planting corn on his farm several years prior to that date, and attached no particular value to the relic, but had sometimes used it in smoking. A brief account of its finding is given in the Proceedings of the Academy, and in substance is republished in Mr. Henshaw's paper.* It will thus be perceived that there are no suspicious circumstances connected with either of these discoveries, but that the surrounding and well-authenticated facts seem to sufficiently establish the genuineness of these interesting relics.

The explicit statements of the explorers as to the discovery of these relics will find strong corroboration in the early inspection made by other members of the Academy, and their reports thereon. Thus, the learned and lamented Dr. R. J. Farquharson, who was guileless in character as he was eminent in science, in a paper upon the inscribed tablets, bears this most emphatic testimony to their genuineness:†

"Shortly after the report of the discovery, several gentlemen, officers of the Academy, visited the excavation, and, through our President, reported that, from the unbroken condition of the layers of shells, and from other evidence visible, they were of opinion that no disturbance of the mound had taken place since the formation of these layers. But the indisputable evidence of the authenticity of the tablets rests in the explicit statement of Rev. Mr. Gass and the gentlemen assisting him, that, *after the penetration of the frozen crust of the earth, they did not leave the spot until the tablets were unearthed by the hands of the former.* This forever silences the doubt in regard to the intrusion or interpolation of these tablets, for, taken in connection with the frozen state of the ground, it makes such an act simply impossible."‡

Equally emphatic is the testimony of Mr. William H. Pratt, the Curator of the Academy, and one of its principal founders. As is well known, this gentleman has given years of gratuitous service in building up the Davenport Academy, and it is due to his exact methods and untiring industry that some scientific order has been

*The quotation from Barber, in Mr. Henshaw's paper, correctly states the circumstances connected with the finding of the elephant pipes; and still, notwithstanding the fact that his quotation refutes his statement, in order to make his point he persists in speaking of Mr. Gass as the "discoverer" of both pipes!

†Proceedings of Davenport Academy of Natural Sciences, Vol. II., p. 107.

‡In a private letter to Prof. Short, Dr. Farquharson thus refers to the finding of one of these pipes: "The ancient mounds were very abundant in that vicinity (Louisa County) and rich in relics, which are deposited on the surface of the soil (not in excavations), as we found in exploring a number. The pipe, which is of fragile sandstone, is of the ordinary Mound-builders' type, and has every appearance of age and usage. Of its genuineness I have no doubt. Together with the 'elephant mound' of Wisconsin, the elephant head of Palenque (depicted in Lord Kingsborough's great work), our pipe completes the series of what the French would call 'documents,' proving the fact of the contemporaneous existence on this continent of man and the mastodon." ("North Americans of Antiquity," John T. Short, p. 531.)

introduced into its valuable museum. During his long and disinterested connection with our Academy, Mr. Pratt has been extensively engaged in archæological research, and is thus well qualified to pass judgment on the authenticity of these relics. In a valedictory address as its President, delivered before the Academy at its annual meeting in 1881, Mr. Pratt thus refers to these questions:

"Some doubts, of course, have been expressed regarding the genuineness of the tablets, though not to any extent by competent and candid archæologists, and we feel no uneasiness on that account: The tablets have been sent to the Smithsonian Institution for examination, and were retained there and subjected to the most thorough scrutiny for two months, during which time the National Academy held its meeting there, and the heliotype plates of them were obtained under the direction of Prof. Baird himself. They were also exhibited throughout the sessions of the meeting of the American Association for the Advancement of Science, last August. Any author or other person who cared to inform himself of the facts has always had ample opportunity to do so, and would at once see that the circumstances of the finding were such as utterly to preclude all possibility of fraud or imposition. The evidence that they are coeval with the other relics—that is, that they were inhumed with them, and before the mound was built—is ample and conclusive, and will be so considered by any unbiased man. No prehistoric relic ever found has better evidence to establish its genuineness than these, and not one suspicious circumstance in connection with them has been pointed out, nor can there be. We shall confidently hope for and gladly welcome further discoveries, by whomsoever made, tending to throw more light upon this still obscure and intensely interesting problem of our earliest predecessors on this continent." *

The late Joseph Duncan Putnam, who gave his young life a martyr to science, was at the date of this discovery Corresponding Secretary of the Academy, and in answer to a letter of inquiry from Prof. Spencer F. Baird, Secretary of the Smithsonian Institution, addressed to that gentleman a communication which is important as a very complete contemporary account written by an officer of the Academy a few days after the finding of the second elephant pipe, and hence is given entire:

"OFFICE OF J. D. PUTNAM, *Corresponding Secretary*
Davenport Academy of Natural Sciences,
 DAVENPORT, IOWA, March 28th, 1880. }

"PROF. S. F. BAIRD—

"*Dear Sir:* Your favor of the 17th inst. duly received during my absence from the city. It will give us pleasure to send you casts of the pipes referred to in my previous letters as soon as we have them made; also of the elephant pipe found last year. There is no doubt in our minds that these two pipes are intended to represent the elephant—at least it seems to require a good deal of imagination to make them look like anything else. In the finding of this last pipe there were three wit-

*Proceedings of Davenport Academy of Natural Sciences, Vol. III., p. 155.

nesses—Rev. A. Blumer, an evangelical clergyman living in Geneseo, Illinois, Rev. J. Gass, a Lutheran clergyman residing in Davenport, Iowa, and a Mr. Hass, for many years owner of the farm on which it was found, and several others. We have never heard a word that would lead us to suspect the integrity of these men from any source whatever (except Eastern archaeologists who know nothing about them). The first elephant pipe was found by a German farmer (Peter Mare, now living somewhere in Kansas), who plowed it up on his farm, in Louisa County, Iowa, some seven or eight years ago. When he moved to Kansas he gave the pipe to his brother-in-law, from whom we obtained it by barter. This man used it habitually for smoking, and valued it highly as a keepsake from his brother. He had no idea of its archaeological value. The history of the finding of these two pipes shows not the slightest evidence of collusion or fraud. They each tend to confirm the genuineness of the other.

“Of the other ‘finds’ of Mr. Gass, and of other members of the Academy, the evidence of genuineness is equally strong whenever it is stated they were taken from the mounds by themselves—as, for example, the three inscribed tablets, the first two of which were found by Messrs. Gass and Willrodt, and the third, a year later, by Messrs. Hume, Gass, and Harrison. When the objects were obtained from third persons the evidences are, of course, not so strong; but the Academy’s collection contains very few such objects.

“In explanation of the many important ‘finds’ made by Mr. Gass, I would say that he is a very tireless worker, and not easily discouraged. The mounds in this region are very numerous, but not one in ten contains anything of value. This causes most men to become easily discouraged, but not Mr. Gass. After opening, say, twenty or more mounds without result, he will commence the next with as much vigor as the first. His work is always thorough, and if there is anything to be found he always finds it. Having charge of a number of small congregations, and going from place to place to preach, he has many acquaintances throughout the country, whom he keeps on the lookout for any archaeological relics that may turn up. He pays his own expenses, and whatever he gets he gives to the Academy. It is in this way the Academy has obtained a number of objects in its collection, the Academy being entirely without funds that can be devoted to this purpose.

“In the same manner we have received very large collections of stone and flint implements and pottery from another of our members, Captain W. P. Hall, who spends most of his time traveling up and down the entire length of the Mississippi and some of its branches, paying his own expenses by working his way, and donating all he gets to the Academy. Many other members, and many persons not members, have done and are doing the same thing. It is this unselfish devotion that has enabled the Davenport Academy to take and to maintain the position it has, notwithstanding the financial poverty of its members. None of our members known to me have any desire either to deceive or be deceived; hence they would be greatly pleased to have the genuineness of these relics, about which some skepticism has been expressed, thoroughly examined into by disinterested archaeologists. We believe this can be best done by personal examination of all the relics from each mound, and by visiting the grounds, examining the persons who assisted in the explorations and the neighbors who live in the vicinity of the mounds. All the relics under suspicion have been found within fifty miles of the city of Davenport, and several of the most important (both tablets) almost within the city limits. We

believe that such an investigation would be of considerable benefit, and feel quite certain that the result would show that, whatever other conclusions might be arrived at, the members of the Davenport Academy have been acting in good faith, a fact which seems to be doubted by some.

"Asking your pardon for the length of this letter, I am, sir,

"Very respectfully yours,

"J. DUNCAN PUTNAM.*

"P. S.—Regarding the interpretation to be put upon these tablets and pipes, there is room for a vast difference of opinion. They may be three hundred or they may be one thousand years old; they may have been made in the locality where found, or they may have been brought from a distance. These and many other questions will probably require many years of investigation to settle, if, indeed, they can be settled.

J. D. P."

In these contemporary accounts, made by gentlemen not unknown among men of science, and who were familiar with all the circumstances connected with these discoveries, we find striking confirmation of the explicit testimony given by the explorers as to the genuineness of these relics. Archæologists will not fail to notice that every precaution was observed and every requirement of science regarded in making these explorations, and that the question of their genuineness is embarrassed by no suspicious circumstances. Bancroft, in his great work, makes these excellent observations:

"The mounds are usually opened by injudicious explorers, or by treasure-seekers, who have paid little attention to the location of the relics found, or the condition of the surrounding soil. Museums and private collections are full of spurious relics thus obtained. It is certain in some cases, and probable in many more, that the mounds have been 'salted' with specimens with a view to their early investigation. Yet many mounds have been opened by scientific men, who have brought to light curious relics, surely the work of the Mound-builders. Such relics are found in the center of the mounds, on or near the original surface of the ground, with the surrounding material undisturbed. In the stratified mounds any disturbance in the soil is easily detected, but with difficulty in others. Reports of unusual relics should be regarded as not authentic unless accompanied by positive proof."†

The discoverers of the relics in question were neither treasure-seekers nor curiosity-hunters, but disinterested and judicious explorers, without thought of pecuniary gain, and only zealous to extend the

* If it is objected to Mr. Putnam that, as an entomologist, he was disqualified as a judge, it may also be objected to Mr. Henshaw that, as an ornithologist, he was disqualified as a critic. While it might be considered unbecoming in the writer to speak in terms of commendation of a son, it will not be thought improper to present the testimony of another as to the qualifications of this young scientist. Prof. Asa Gray, who had excellent opportunities for forming an opinion, says of him: "What struck me in my intercourse with Putnam was his sobriety of judgment and simplicity of spirit. Never have I seen a cooler and, as we say, more level, head upon young shoulders." (Proceedings of Davenport Academy of Natural Sciences, Vol. III., p. 215.)

† Bancroft's "Native Races," Vol. IV., p. 773.

domain of science. Every essential circumstance was carefully noted — the location of the relics, the condition of the surrounding soil, the evidence of undisturbed strata. The explorers were only embarrassed by the extraordinary character of their discoveries, and were fortunate in being able to furnish for these "unusual relics" that "positive proof" demanded by Mr. Bancroft's rigid rule.

This rapid review will serve, in some measure, to recall the circumstances surrounding the discoveries in question, and in a slight degree to indicate their great scientific value. If their authenticity is established, then archaeologists will find in them strong corroborative evidence that man and the mastodon were contemporary on this continent, and that the Mound-builders were a race anterior to the ancestors of the present American Indians, and of higher type and more advanced civilization. As this conclusion would conflict with the theory announced by the Bureau of Ethnology, Mr. Henshaw was compelled to discredit these important discoveries.* Before his "destructive criticism" the characters of men and the verities of science must alike be swept away to make room for a favorite theory. It was doubtless unfortunate for the Davenport Academy that its remarkable discoveries impeded the progress of this knight-errant of science;† but if its elephant pipes and inscribed tablets were authentic and genuine, then his favorite theory would seem to be at fault. He does not hesitate, therefore, to throw discredit upon these relics, to assail the honesty of the discoverer, and to impale with his scathing censure the institution that published them to the world. It is, therefore, full time for a calm and thorough review of all the circumstances surrounding these discoveries, with the view of finally disposing of all questions as to their authenticity.

That we may not in the slightest degree misrepresent the Bureau of

* We must not be understood to condemn all "theory" as without use in scientific research. We only condemn its abuse. It must be conceded that theory is a tireless pioneer of progress, and has inspired many a great worker in science to follow its light into vast unknown seas, until, as with Columbus, a new continent has dawned upon his vision. Let archaeologists therefore, if they please, weave their "theories" out of the very gossamers of thought, if so be it induce them to delve more industriously in earth-work and mound for their "facts." In the dawning light the unsubstantial theory may melt away, but the ultimate facts will remain, an imperishable possession.

† The appellation in the text is not undeserved. Mr. Henshaw presents an "illustration" of a tailless elephant which is itself a fraud; he then assumes that all the relics in question were the "finds" of "one individual," which is false. Having thus conjured through his imagination this unreal state of "facts," he then triumphantly proceeds to demolish it. For a parallel to this performance we must resort to fiction. We shall find its analogue in the memorable tilt of the valorous Knight of La Mancha with the unoffending windmills!

Ethnology, or its champion, Mr. Henshaw, we will extract from this remarkable paper a few choice specimens as illustrations of its tone and temper. Disregarding entirely the strong evidences of the authenticity of these relics which we have thus plainly presented, Mr. Henshaw proceeds to assail them with this "destructive criticism:"

"In considering the evidence afforded by these pipes of a knowledge of the mastodon on the part of the Mound-builder, it should be borne in mind that their authenticity as specimens of the Mound-builder's art has been seriously called in question. Possibly *the fact that the same person was instrumental in bringing to light both of the pipes has had largely to do with this suspicion*, especially when it was remembered that, although explorers had been remarkably active in the same region, it has fallen to the good fortune of no one else to find anything conveying the most distant suggestion of the mastodon. * * * The remarkable archaeological instinct which has guided the finder of these pipes has led him to some more important discoveries. By the aid of his divining-rod he has succeeded in unearthing some of the most remarkable tablets which have thus far rewarded the diligent search of the mound explorer. * * *

"Archæologists must certainly deem it unfortunate that, outside of the Wisconsin mound, the only evidence of the coexistence of the Mound-builder and the mastodon should reach the scientific world through the agency of one individual. So derived, each succeeding carving of the mastodon, be it more or less accurate, instead of being accepted by archæologists as cumulative evidence tending to establish the genuineness of the sculptured testimony showing that the Mound-builder and mastodon were coeval, will be viewed with ever-increasing suspicion." * *

* * Bearing in mind the many attempts at archaeological fraud that recent years have brought to light, archæologists have a right to demand that objects which afford a basis for such important deductions as the coeval life of the Mound-builder and mastodon should be above the slightest suspicion, not only in respect to their resemblances, but as regards the circumstances of their discovery. If they are not above suspicion, the science of archæology can better afford to wait for further and more certain evidence than to commit itself to theories which may prove stumbling-blocks to truth, until that indefinite time when further investigation shall show their illusory nature." *

We find here an abundance of hints, innuendoes, imaginings, suspicions, without the statement of a fact to justify them. Had it been more specific, this paper would have had more force. In a grave scientific essay, controverting the authenticity of some very important discoveries, it should have been stated when, where, how, by whom, and for what reasons the genuineness of these relics had been "seriously called in question." To controvert a statement with a sneer is the peculiar achievement of the ordinary polemic, and cannot be set down among accepted scientific methods.

*Second Annual Report Bureau of Ethnology, Washington, 1880-81, pp. 156, 157, and 158 ("Animal Carvings from Mounds in the Mississippi Valley," by H. W. Henshaw).

In entering upon his work of demolition, it was open to Mr. Henshaw to make some show of thorough investigation and fair treatment. The circumstances called for it. He occupied a conspicuous position and wielded large influence. If his criticism was well founded, it would serve a useful purpose in driving charlatans from the fold of truth. If based only on partial investigations, and without substantial foundation, his censure would tend to destroy confidence in all historical evidence, discourage original research, and poison truth at its very fountain-head. When, therefore, Mr. Henshaw was forced by the exigencies of his theory to assail these discoveries, archæologists had a right to expect that he would make thorough examination into the evidence of their genuineness; that he would visit the scenes of these explorations and take careful note of the surroundings; that he would make searching inquiry as to the character and reliability of the discoverers; that he would closely question the members of the Davenport Academy as to the existence of any suspicious circumstances; that he would make critical inspection of the relics themselves to note peculiarities which might escape an eye less thoroughly trained than his own; and that, in this just and judicious manner, he would seek to satisfy all reasonable scruples of the earnest and conscientious seeker after truth. All this was easy for Mr. Henshaw, for he had at his command unlimited resources. It will be learned with surprise that he did none of these things. This feeling will be increased to astonishment when it is ascertained that, instead of adopting these wise precautions, Mr. Henshaw seized with avidity upon a stray paper, written by a gentleman in no way connected with the Davenport Academy, imperfectly illustrated with some coarse wood-cuts, and published in an Eastern magazine, and that he made this second-hand information the poor excuse for his unscientific screed. When, in addition to all this, it is found that Mr. Henshaw never consulted the extensive correspondence concerning these relics in the possession of the Smithsonian Institution, and apparently never gave even a passing glance to the photographs of these elephant pipes in its museum, archæologists will regard with just resentment these scientific delinquencies of this eminent gentleman.

In that portion of his paper relating to "animal carvings," Mr. Henshaw makes the statement that the celebrated "elephant mound" of Wisconsin represents neither tusks nor tail, and that the sculptors of the "elephant pipes," taking that mound for a model, have even imitated these omissions! Through these similarities Mr. Henshaw suggests an argument against the authenticity of these relics! As to the

absence of "tusks" in both mound and pipes, Mr. Henshaw is doubtless correct. This omission in the pipes, however, could be sufficiently accounted for from the difficulty the ancient artist would experience in representing them in the soft sandstone used for the purpose of this carving. As will be seen, Mr. Barber adopts this view :

"It is, to say the least, a singular fact that the most characteristic feature of this pachyderm, the prominent tusks, should have been omitted both in the pipe sculpture and the 'big elephant mound,' if the ancient Americans were acquainted with the model. The long, slender, curved tusks, however, would be difficult to imitate, either in the miniature stone sculptures or the embankments of earth, and might have been purposely ignored." *

In his "Inglorious Columbus" Mr. Edward P. Vining also notices these omissions, and suggests this plausible explanation :

"There are in the possession of the Academy of Natural Sciences of Davenport, Iowa, two carved stone pipes, of which representations are given. * * * They seem to be unmistakable representations of an elephant, or some closely allied quadruped, and their makers must have been acquainted with the animal. The Davenport Academy also have a tablet, found in a mound near their city, containing some thirty rude pictures of animals. Most of them can be recognized, and among them there are two that seem intended for elephants. It may be worthy of notice that in these drawings, in the pipes, and in the sculptures of Yucatan, the animal's head is uniformly represented without any trace of tusks. In that otherwise truthful representation of the mastodon, the elephant mound of Wisconsin, the artist has also totally omitted the tusks, and shortened the trunk to very moderate dimensions—surely not for want of space, for the whole animal has a length of over one hundred feet, and a proportionate height. There therefore seems some reason for believing that an animal much resembling the elephant, but destitute of tusks, existed in America up to a comparatively recent date." †

In his "Mammalia" Figuier remarks, concerning elephants' tusks, that "in the females they are sometimes very slightly elongated, and do not project beyond the lips," and that "in the Indian species they are indeed wanting in the females; so also, either one or both of them, in not a few of the males." ‡ Mr. John Gibson also makes the statement that "in the Asiatic elephant the tusks grow to a considerable size in the male, but are wanting in the female; while in the Ceylon elephant tusks are also absent in the female, and only exceptionally present in the male." § Taken in connection with the supposed Asiatic origin of the aborigines of the Pacific slope, these interesting

* *American Naturalist* for April, 1882, p. 277.

† "An Inglorious Columbus," pp. 609-611.

‡ "Mammalia," by Louis Figuier, p. 116.

§ "Encyclopædia Britannica," ninth edition; title, "Elephant."

facts suggest another possible explanation of these omissions in the pipes. In this connection, it may be mentioned as at least a curious coincidence that in the representation of the elephant in Johnson's Cyclopaedia the artist has also omitted the tusks.

While the explanations we have presented may be somewhat conjectural, and perhaps not entirely satisfactory, it can still be claimed, with entire confidence, that the omission of the "tusks" in these carvings furnishes no basis whatever for a suspicion of "fraud." An artist possessed of sufficient skill to sculpture these pipes, and intending to deceive and defraud, would have closely followed his model, and surely would never have omitted one of its most striking features. Beyond a peradventure, an artistic knave would have given us tusks, trunk, tail, and all. The omission, therefore, of the former in these representations tends to establish the honesty of the artist and furnishes a strong argument in favor of the authenticity of these relics.

In the argument of Mr. Henshaw, based upon the absence of the "tail" in these carvings, he is peculiarly unfortunate. He has been misled, no doubt, by the faulty "illustrations," which alone he must have consulted, inasmuch as in each of these pipes the "tail" is well developed. It will also be found clearly represented in the photographs sent to the Smithsonian Institution, in the illustrations of the pipes given in the Proceedings of the Davenport Academy, and in the stamp on the cover of the volume. So, too, in the "Prehistoric America" of Nadaillac, quite recently introduced to the American public by a noted archaeologist (Mr. Dall), we find an illustration of one of these identical elephant pipes, with the missing "tail" in full view! It is a noticeable circumstance, that, while Barber, Vining, and other writers commented upon the absence of "tusks," it remained for Mr. Henshaw to make the remarkable discovery that the "tail" was also missing in these carvings. The conclusion is inevitable, that Mr. Henshaw drew largely upon Mr. Barber's article for his scientific material, and that he was betrayed into the commission of this mistake by the "imperfection" of the illustrations used by Mr. Barber and copied by Mr. Henshaw without verification.

The following are correct illustrations of the two elephant pipes now in our museum. Figure 1 represents the pipe plowed up by Peter Marc in a corn-field in Louisa County, Iowa, and Figure 2 that discovered by Rev. A. Blumer in a mound in the same county:*

*For these illustrations we are indebted to the courtesy of Mr. Edward P. Vining, author of "An Inglorious Columbus."

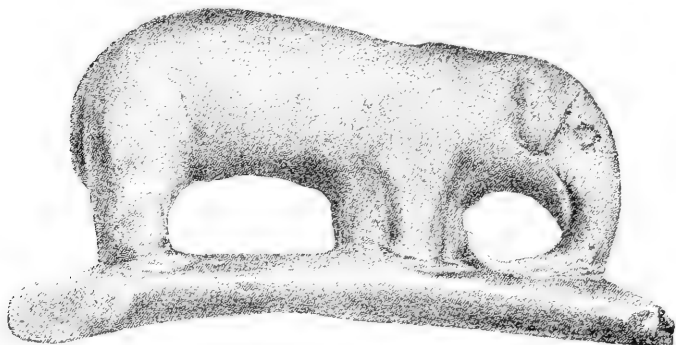


FIG. 1.—PIPE FOUND IN A CORN-FIELD, LOUISA COUNTY, IOWA,—TWO-THIRDS SIZE.



FIG. 2.—PIPE FOUND IN A MOUND, LOUISA COUNTY, IOWA,—FULL SIZE.

With these illustrations in view, archæologists will read with amusement the singular argument of Mr. Henshaw, based upon the supposed absence of the "tails" in these pipes:

"It is also remarkable that in neither of these pipes is the tail indicated, although a glance at the other sculptures will show that in the full-length figures this member is invariably shown. In respect to these omissions, the pipes from Iowa are strikingly suggestive of the elephant mound of Wisconsin, with the peculiarities of which the sculptor, whether ancient or modern, might almost be supposed to have been acquainted. It certainly must be looked upon as a curious coincidence that carvings found at a point so remote from the elephant mound, and

presumably the work of other hands, should so closely copy the imperfections of that mound."*

The accuracy of the foregoing representations can easily be verified by comparison with the photographs of these pipes in possession of the Smithsonian Institution. As will be seen by "a glance" at the above representations, the "tail" is therein clearly "indicated," and Mr. Henshaw's flimsy argument is, therefore, left without foundation, and he stands convicted of an inexcusable blunder. This ludicrous mistake on the part of Mr. Henshaw clearly reveals the culpable carelessness of his scientific methods.† It will be found, moreover, upon careful examination, that the differences between the Wisconsin mound and the elephant pipes are more numerous than their resemblances—the full-length proboscis and the tail, ears, eyes, and mouth all being fully represented in the pipes and wanting in the mound; and hence, in the one point of similarity, from the absence of tusks, there is no sufficient basis for his argument. To enable the reader to make comparison of these elephant pipes with this Wisconsin mound, an illustration of the latter is here given.‡

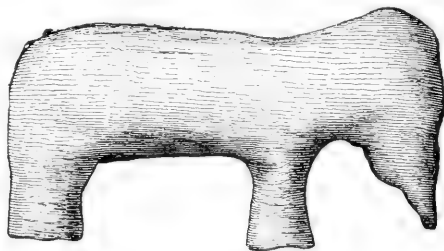


FIG. 3.—BIG ELEPHANT MOUND IN GRANT COUNTY, WISCONSIN.

The absence of "ivory" relics in the mounds is also urged by Mr. Henshaw to strengthen his argument. A sufficient explanation of this circumstance will be found in the accepted hypothesis that at the era

*Second Annual Report Bureau of Ethnology, 1880-81, p. 156.

† Mr. Henshaw manifests zeal in the exposure of deceptions, and yet the very representations of our elephant pipes employed by him to embellish his paper are themselves archæological "frauds" of singular enormity; and as the unfortunate citizen found with the kit of a counterfeiter in his grip-sack is required by the law to justify his possession, so Mr. Henshaw may properly be called upon to explain the origin of these "tailless" illustrations. The curious reader who will compare them with the true representations, as found in the *Academy Proceedings*, or even in the recent work of Nadaillac, will find himself in "serious doubt" whether Mr. Henshaw's argument was framed to fit his fancy illustrations, or the illustrations were designed to support his argument.

‡ For this illustration we are indebted to the courtesy of Mr. Edward P. Vining, author of "An Inglorious Columbus."

of the Mound-builders the elephant and mastodon must have nearly reached the point of extinction on this continent, and hence would be infrequently seen and the article of "ivory" quite uncommon. Assuming this as a fact, it will furnish a reasonable explanation both of the absence of ivory in the mounds and of imperfect representations in the carvings. It is, moreover, quite within the range of probability that future explorations of innumerable mounds still unopened may bring to light the missing relics. Be this as it may, it is clearly obvious that the absence of "ivory" in the mounds cannot be considered a badge of fraud in our tablets. The article of ivory is abundant, and a "scientific knave" intending to deceive, with a cunning appreciation of its importance, would never have failed to "salt" the mound with a needed supply. As in the case of the omission of "tusks," the absence of "ivory" in the mounds in question must be considered rather an evidence of genuineness than fraud.*

A singular perversion of facts on the part of Mr. Henshaw still remains to be noted. After quoting at length from a communication addressed to Mr. Barber by the President of the Davenport Academy, wherein it is clearly stated that one of the elephant pipes was found by Peter Mare, an illiterate German farmer, and the other was discovered by the Rev. Mr. Blumer, Mr. Henshaw curiously enough proceeds as follows:

"It will be seen from the above that *the same gentleman* was instrumental in bringing to light the two specimens constituting *the present supply* of elephant pipes. *The remarkable archaeological instinct* which has guided the finder of these pipes has led him to even more important discoveries. *By the aid of his divining-rod* he has succeeded in unearthing some of the most remarkable inscribed tablets which have thus far rewarded the diligent search of the mound explorer."

The unfounded and ungenerous insinuations contained in this remarkable passage will require neither commentary nor condemnation. When it is remembered that no less than *six* highly respected citizens were engaged in these explorations, and no less than *three* were present at each discovery, and when it is further noted that the person who unearthed the inscribed tablets is not "the same gentleman" who discovered the elephant pipes, and that the pipes themselves were discovered by different individuals, archaeologists may well conclude that a writer so reckless in the use of his "facts" is wholly unqualified for the important work he has undertaken. Deductions so loosely made are many degrees beneath the dignity of serious scientific criticism.

* In the *American Antiquarian* for March, 1880, Rev. S. D. Peet announced the discovery of one of these pipes, and expressed the opinion that it clearly represented the "elephant."

In all this "destructive criticism," which Major Powell commends as "successful," the only "fact" presented as a basis for their sweeping "suspicions" is this same fictitious statement, that *the explorer was alone when he made his discoveries*. It would seem, in the view of Mr. Henshaw, that explorers should go to their work with a body-guard of affidavit-makers, or, peradventure, with some accredited representative of the Bureau of Ethnology, to verify each discovery; and that, unless so witnessed, such discovery must be discredited. As the finding of many of these relics is accidental, and often by men having little appreciation of their scientific value, the adoption of so narrow a rule would eliminate from our museums some of the most remarkable mementos. This low estimate of human nature does not correctly represent the liberal spirit of pure science. All of us can point to earnest and disinterested workers, impelled by the love of science, with no thought of gain, whose single, simple word would be received with absolute trust, when the carefully verified narratives of a crowd of professional collectors, delving for hire, would be regarded with well-founded distrust. Had Mr. Henshaw taken the trouble to ascertain this important fact, he would have found that the principal discoverer of the inscribed tablets belonged to this select circle of voluntary workers, and that, in his own home, his word was beyond question and his character above reproach. In this connection it may properly be stated that Mr. Gass, who, as the discoverer of these unique relics, is assailed by Mr. Henshaw, is now preaching to a congregation at Postville, in Northern Iowa, where he is, as he everywhere has been, highly esteemed by his people. He is a good classical scholar, well grounded in Hebrew, but with a decided scientific bent of mind, which accounts for his perseverance and enthusiasm in these archæological explorations. It would seem that his fine abilities, extensive attainments, high social position, and spotless character should have shielded him from attack; and if, peradventure, it ever falls to the lot of his assailants to themselves encounter "destructive criticism," it will then serve them in good stead should they be able to confront it with as clean a record.

The unjustifiable attack made by Mr. Henshaw upon the scientific character of Mr. Gass is followed with the warning that in future all such explorations must cease, and enforced with the dire threat that any more such discoveries will surely encounter the "ever-increasing suspicion" of archaeologists! We will repeat this unique paragraph, and bespeak for it careful attention, as a scientific curiosity:

"Archæologists must certainly deem it unfortunate that, outside of the Wisconsin mound, *the only evidence* of the coëxistence of the Mound-builder and the mastodon should reach the scientific world through *the agency of one individual*. So *derived*, each succeeding carving of the mastodon, be it more or less accurate, instead of being accepted by archæologists as cumulative evidence, tending to establish the genuineness of the sculptured testimony showing that the Mound-builder and mastodon were coeval, *will be viewed with ever-increasing suspicion*."

As will be perceived in reading this passage, the condemnation is absolute, the prohibition complete! In the view of Mr. Henshaw, no genuine elephant pipe has been, or can be, discovered. The discovery of a new elephant pipe, he considers, would not confirm the previous discovery, but, instead, would add to the "suspicion" of its genuineness! The guilt of the explorer, in his distorted vision, increases with his success! The possibility of conscientious research is thus denied to the solitary student of science. As we turn over the pages of this writer, the air seems murky with "doubts" and "suspensions," with "frauds" and "forgeries." The mandates he issues appear to have been framed for a company of convicts! Now, if this arrogant assumption on the part of Mr. Henshaw was not utterly puerile, it would be simply "monstrous!"* That such doctrines should have emanated from the Smithsonian Institution, "will be viewed with ever-increasing" wonder. "Archæologists must certainly deem it unfortunate" that an institution established "for the increase and diffusion of knowledge" should thus endeavor to discourage research and stifle thought!

Archæologists will not fail to notice the bold, unequivocal statement made by Mr. Henshaw, that the "only evidence of the coëxistence of the Mound-builder and mastodon" is such as may be furnished by these elephant pipes and inscribed tablets. That any gentleman who had passed the alphabet of archæology could have the hardihood to confront its extensive literature with such a statement is quite unaccountable. Turning to the accepted records of archæology, among which may be cited Lubbock's "Prehistoric Times" and Foster's "Prehistoric Races in the United States," we find many other interesting discoveries, earlier in date, of like character and equal importance with these elephant pipes and inscribed tablets. We will, at this time, only call attention to some of the more important of these relics which seem to furnish valuable evidence as to "the coëxistence of the Mound-builder and mastodon." We now refer to the following:

*This strong adjective is quoted from the private communication of a well-known archæologist, and was used by him to express his disgust with the extraordinary doctrines announced by Mr. Henshaw in the above passage.

First. We find, in the transactions of the St. Louis Academy of Sciences, in 1857, a detailed statement, by Dr. A. C. Koch, of the remains of a mastodon found in Gasconade County, Missouri, and with it, among ashes, bones, and rocks, several arrow-heads and some stone axes, which relics are preserved in the British Museum.

Second. Dr. Dickson, of Natchez, many years ago, found the pelvic bone of a man with the remains of mastodon and megalonyx, which specimens are preserved in the museum of the Philadelphia Academy of Sciences.

Third. Count Pourtales, in 1848, found in Florida some human bones in a calcareous conglomerate, estimated by Agassiz to be ten thousand years old. Pourtales will be remembered as the friend and favorite pupil of the great naturalist.

Fourth. In an excavation in New Orleans, some charcoal and a human skeleton were discovered to which Dr. Dowler attributes an antiquity of no less than fifty thousand years. This estimate was based upon the deposits and forests found above the remains, and as connected with this question was the age of the delta of the Mississippi, it may be stated that this has been estimated by Sir Charles Lyell as probably reaching one hundred thousand years.

Fifth. In 1857, Dr. C. F. Winslow sent the Boston Natural History Society the fragment of a human cranium, found, in connection with the bones of the mastodon and elephant, one hundred and eighty feet below the surface of Table Mountain.

Sixth. Prof. Whitney deposited in the museum of the State Geological Society of California a human cranium, discovered deep down in the gold drift, and covered with five successive overflows of lava.

Seventh. T. T. Cleu contributed to the Smithsonian Institution a specimen of ancient basket-work, or "mat made of interlaced reeds," found on Petit Anse Island, some fifteen or twenty feet below the surface, and on a bed of rock-salt, and about two feet above it, were the remains of the tusks and bones of a fossil elephant. *This "mat" is now in the National Museum, at Washington.**

Eighth. In 1867, E. W. Hilgard and Dr. E. Fontaine, Secretary of the New Orleans Academy of Sciences, explored the location last above referred to, and discovered, twelve feet below the surface and immediately adjoining the rock-salt, incredible quantities of pottery mingled with fragments of the bones of the elephant.

*Prof. Henry, late Secretary of the Smithsonian Institution, affixed to this remarkable relic in the National Museum the following interesting sketch: "Petit Anse Island is the locality of the remarkable mine of rock-salt, discovered during the civil war, and from which, for a considerable time, the Southern States derived a great part of their supply of this article. The salt is almost chemically pure, apparently inexhaustible in quantity, occurring in every part of the island (which is about five thousand acres in extent), at a depth below the surface of the soil of fifteen or twenty feet. The fragment of matting was found near the surface of the salt, and about two feet above it were remains of tusks and bones of a fossil elephant. The peculiar interest in regard to the specimen is in its occurrence *in situ* two feet below the elephant remains, and about fourteen feet below the surface of the soil, thus showing the existence of man on the island prior to the deposit in the soil of the fossil elephant. The material consists of the outer bark of the common southern cane (*Arundinaria macrosperma*), and has been preserved for so long a period both by its silicious character and the strongly saline condition of the soil." It thus appears that Prof. Henry regarded this relic as furnishing valuable evidence of the co-existence of man and the mastodon on this continent. ("The Archaeological Collection of the United States Museum, in charge of the Smithsonian Institution," by Charles Rau, "Smithsonian Contributions to Knowledge," No. 287, p. 80.)

Ninth. Dr. Holmes made a communication to the Philadelphia Academy of Sciences, several years since, in which he described the occurrence of fragments of pottery in connection with the bones of the mastodon and megatherium.

These are among the earlier discoveries, familiar to archæologists, tending to prove the coëxistence of man and mastodon on this continent. While ample for our purpose, the list might be considerably extended. The details of these discoveries can be found in any respectable work on archæology.* While it may be claimed that the authenticity of some of the relics in the foregoing list has been "seriously called in question," it will be found impracticable, by any process of "destructive criticism," however sweeping, to entirely destroy their weight as evidence, more or less valuable, upon this important question. Until successfully controverted, they must stand as at least

* Foster's "Prehistoric Races in the United States," pp. 52, 78.

Lubbock's "Prehistoric Times," pp. 286-288.

"Prehistoric America," by Nadaillac, pp. 33-45.

Baldwin's "Ancient America," pp. 47-56.

"Mastodon, Mammoth, and Man," by MacLean, pp. 13-20.

MacLean's "Mound-builders," p. 136.

Nott and Gliddon's "Types of Mankind," p. 352.

"Antiquity of Man," by Sir Charles Lyell, pp. 43, 203.

Dana's "Manual of Geology," pp. 577, 578.

Transactions of St. Louis Academy, Vol. I., p. 62, 1857.

"Smithsonian Contributions to Knowledge," No. 248, "On the Geology of Lower Louisiana, and the Salt Deposit on Petit Anse Island," by E. W. Hilgard, p. 14.

Southall's "Recent Origin of Man," pp. 550-560.

Short's "North Americans of Antiquity," pp. 112-130.

Winchell's "Pre-Adamites," pp. 435, 436.

"Mesozoic and Cenozoic Geology and Paleontology," by S. A. Miller, Journal of the Cincinnati Society of Natural History, Vol. IV., p. 215.

"Contributions to the Geology of Ohio," by Col. Charles Whittlesey, pp. 10-13.

"Evidences of the Antiquity of Man in the United States," by Col. Charles Whittlesey, a paper read before the Association for the Advancement of Science, at Chicago, in 1868, pp. 13-15.

"Antiquity of the North American Indians," by Charles C. Jones, Jr., *North American Review* for January, 1874. In this well-considered paper, Col. Jones, after a careful review of the evidence above given, thus clearly states his conclusions: "While we cannot at present ascertain, and perhaps never will be able to determine, the antiquity of the North American Indians, we think it may now be affirmed with considerable confidence — *1st*, that the primitive peoples of the Mississippi Valley and of the south-eastern portions of the North American continent were domiciled here when the mammoth, the mastodon, and other extinct animals roamed the primeval forests; *2d*, that many of the grave-mounds and earth-works of the red race are fully a thousand years old, while others may well claim an antiquity far greater than this; *3d*, and lastly, that the Indian occupancy in various portions of this continent was very ancient, probably dating as far back as the earliest traces of man in Western Europe."

Encyclopædia Britannica, 9th ed., title "American Indians," pp. 691, 692, cites above stated discoveries to establish the great antiquity of man in America.

These are only a portion of the citations which might be made from well-known scientific writers, and yet Mr. Henshaw seems to have written his paper in profound ignorance of the existence of this extensive literature.

prima facie proof of the fact, and the evidence to disprove the genuineness of these discoveries must consist of something beside misty doubts and suspicions. It thus appears that the evidence furnished by the elephant pipes is not the "only evidence," but is strongly corroborative of the prior evidence furnished by the above discoveries of the coëxistence of man and the mastodon. Still, with all this literature within easy reach, Mr. Henshaw coolly ignores its existence, and calmly informs the scientific world that the elephant pipes furnish "the only evidence" in support of that hypothesis.*

Many of these earlier discoveries are noted and discussed in Sir John Lubbock's valuable work upon "Prehistoric Times," and in his estimate of their value to science he observes a caution as commendable as it is discriminating. Commenting upon the discovery narrated by Dr. Dowler, he expresses, with scientific precision, his hesitation about its acceptance, as follows:

"Whether, therefore, we accept Dr. Dowler's calculation or not, it is obvious that, if the statements are thoroughly trustworthy, this skeleton certainly must carry back the existence of man in America to a very early period. Yet, until further evidence is obtained, the question cannot, I think, be regarded as entirely decided; and even if on *a priori* grounds the idea seems probable, there does not, as yet, appear to be any conclusive proof that man coëxisted with the mammoth and mastodon."†

It must not be overlooked that Sir John Lubbock based his reasoning entirely upon the earlier discoveries we have enumerated, and we are justified in the conclusion that the subsequent finding of these elephant pipes and inscribed tablets would have furnished him with the "further evidence" required to complete and make conclusive his chain of evidence. As aptly expressed by Dr. Farquharson, "In the elephant pipes we have the key-stone of the arch of evidence which has been building for so many years." Nadaillac, in his recent work, thus states his conclusions:

"The first Americans, too, were contemporary with gigantic animals, which, like their conquerors of Europe, have passed away never to return. They had to contend with the mastodon, the megatherium, the mylodon, the megalonyx, the elephant, with a jaguar larger than that of the present day, and a bear more formidable than that of the caves. Like our forefathers, they had to attack and over-

* Prof. Baird, in Smithsonian Report for 1882, in giving an account of the operations of the Bureau of Ethnology, thus notices the mound explorations under Prof. Cyrus Thomas: "The most important results appertain to the mounds and works themselves. *The statement in the Smithsonian Report for 1872 in reference to the elephant mound is confirmed; the Seltzertown mound is proven to be a myth — at least no sign of it can be found on examination.*"

† Lubbock's "Prehistoric Times," p. 288.

come them with stone hatchets, obsidian knives, and all the wretched weapons the importance of which we have been so long in recognizing in America, as in Europe."*

Neither must it be overlooked that Mr. Henshaw himself admits that the extinction of the mastodon on this continent was a very recent event — *probably within five hundred years prior to its discovery* — and that, inasmuch as an antiquity of at least a thousand years has been assigned to the mounds, there are, therefore, no inherent absurdities in the belief that the Mound-builders were acquainted with the mastodon. In a paper upon the "Post-tertiary Phenomenon of Michigan," Prof. Winchell remarked, concerning the peat-beds, that "These beds are the sites of ancient lakelets, slowly filled up by the accumulation of sediment. They enclose numerous remains of the mastodon and mammoth. They are sometimes found so near the surface that one could believe they have been buried *within five hundred or a thousand years*."† On the other hand, Mr. James Orton‡ joins with Sir John Lubbock in assigning to man in America an antiquity of at least three thousand years;§ and Dr. Charles C. Abbott, in confirmation of these views, remarks: "It is unquestionable that many of the remains of the mastodon found in New Jersey and New York are far more recent than some of the relics of man, *and it is simply impossible that even so late a comer as the Indian should not have seen living mastodons on the Atlantic seaboard of this continent*."|| It seems to be established, therefore, that the date of the extinction of the elephant and the date of the appearance of man in America overlapped during a long lapse of time, and that for a period of a thousand or more years man and the mastodon must have coëxisted on this continent. Yet, while this fact seems to be admitted by Mr. Henshaw, his admission is qualified with serious "doubts" as to the sufficiency of the "proof presented to substantiate it." In his eagerness to find some support for his "doubts," he approaches, if he does not overstep, the limits of legal libel, in misrepresenting the pipes by the use of false illustrations, and in charging Mr. Gass with the perpetration of a mercenary fraud, and violates all canons of propriety in branding, by implication, the members of the Davenport Academy as participants in this disgraceful deception.

* "Prehistoric America," by Nadaillac, p. 15.

† "Recent Origin of Man," p. 331 (Annual of Scientific Discovery, 1871, p. 239).

‡ "The Andes and the Amazons," 3d ed., p. 109.

§ "Prehistoric Times," p. 286.

|| *Popular Science Monthly*, July, 1885, p. 310.

In his introductory chapter, Major Powell commends Mr. Henshaw to the public as "a trained scholar, who can discern the germ of truth even in a blundering statement, and whose own knowledge is a touchstone for the detection of spurious productions." We fail to discern this wonderful "touchstone" in the deplorable want of information in Mr. Henshaw which we have been compelled to expose, and from the "blundering statements" made by him, containing not a "germ of truth," it is evident his intellectual equipment is insufficient for a successful teacher of archæology.* As an ornithologist of acknowledged skill and ability, he was well fitted to engage in the special research properly before him, and in his important undertaking he would have found a broad and unoccupied field. The tracing of resemblances between the carvings found in the mounds and known species of birds and animals was a legitimate object, involved important deductions, and, if thoroughly and conscientiously executed, the results must have had great scientific value. Unfortunately, as it turned out, Mr. Henshaw was unwilling to be trammelled by any such limitations; and hence, most unwisely abandoning his special work, this "naturalist," with infinite complacency, takes his place among trained archæologists, revises their methods of exploration, and promulgates new canons for archæological research!

"Now, in the names of all the gods at once,
Upon what meat doth this our Cæsar feed,
That he is grown so great?"

In this connection, the fact should not be overlooked that the so-called "Bureau of Ethnology" was not established for the purpose of conducting explorations in archæology, but, as its name implies, with the special object in view of prosecuting "researches among the North American Indians," and it will be found that, with a single unimportant exception, no appropriations have been made by Congress specially for archæological research. The study of American antiquities has been only incidentally included as remotely connected with the study of our native races. Neither should we overlook the further fact that formerly these ethnological researches were prosecuted in connection with the Rocky Mountain survey under Major Powell, and that upon

*In view of this attack upon Mr. Gass, the writer recently submitted some inquiries to a noted archæologist as to the standing of Mr. Henshaw among them, and received this curious answer:—"Of course the Bureau has a right to attack the authenticity of anything it wants to; but the insinuations against Mr. Gass are simply contemptible. Of all forms of libel, I think that of insinuations the meanest. Henshaw, so far as I know, has no standing among archæologists. I am free to say I have no recollection of having ever heard of him."

the consolidation of the various surveys under one management, the Department of Ethnology was nominally detached from the Geological Survey and attached to the Smithsonian Institution. Major Powell, the director of the geological survey, was, however, continued in the charge of this ethnological work, and hence the only noticeable change in practical operations was a sounding title and additional appropriations! As was to be expected, Major Powell called about him his former assistants, and thus we have the singular spectacle presented of explorations among American antiquities conducted by geologists, ornithologists, entomologists, and ethnologists, without the aid of experienced archæologists! When it is remembered how exacting are the requirements of science, and how its most minute departments have become the life-work of trained *specialists*, it may well be questioned whether the genius of man is capable of passing successfully from one to another of these fields of research. Be this as it may, archæologists will welcome to their ranks, from any source, all modest and earnest students; but when these new-comers in archæology set themselves up as critics, it is in order to question their authority! Official position merely does not confer it; and the venerable author of the "Ancient Monuments," in his retirement, is to-day, throughout the world of science, a higher "authority" in archæology than the entire "Bureau of Ethnology."*

* An examination of the *personnel* of the Bureau of Ethnology will make it clear that there is no exaggeration in the above statement. The scientific fame of Major Powell rests mainly upon his researches in geology. The triumphant exploration of the Grand Canon threw a glamour of romance over his career, and secured him high position among the veritable heroes of science. It certainly cannot be said of Major Powell, as was asserted of one of his predecessors, that he is a "geologist by act of Congress," for, while he has no claim to high rank as an archæologist, it is undoubtedly true that, in his special field of geology, he has attained deserved eminence throughout the world of science. Of Prof. Cyrus Thomas, who has charge of the archaeological department of the Bureau, it may be said that during the maturity of his life, while ecclesiastically interested in the gathering-in of souls, he was scientifically engaged in the gathering-in of insects. Upon his ultimate abandonment of the pulpit he accepted the position of State Entomologist of Illinois, and, by skill and ability in the performance of its duties, he attained deserved eminence in his chosen field of entomology. Late in life Prof. Thomas abandoned the study of both theology and entomology, and engaged in the exploration of American antiquities. Archæologists will undoubtedly extend to this accomplished gentleman a kindly welcome, but his special achievements in archæology are yet to be disclosed. Of Mr. Henry W. Henshaw, who is also connected with this department, it has already been sufficiently indicated that he is quite ignorant of everything pertaining to the science of archæology; and it may be added that his claim to be considered even an ornithologist seems to rest mainly upon Major Powell's recommendation. We have thus properly located among these gentlemen the geologist, entomologist, and, probably, the ornithologist, of the Bureau, and it only remains to ascertain the "ethnologist" we have conceded to this department. In doing this we have experienced some perplexity, and it may, after all, turn out that the "ethnologist" is also missing in this singular "Bureau of Ethnology." We will, however, assume that Major Powell's great ability is equal to the mastery of this other broad and interesting field of research. We must not omit to make

In the same volume which contained Mr. Henshaw's paper, Mr. William H. Holmes has an admirable monograph upon "Art in Shell," and in describing the "Missouri Gorget" he states that it was obtained from unknown persons in South-western Missouri. Upon the question of its genuineness, Mr. Holmes remarks:

"It was chalky and crumbling from decay; the lines of the design bear equal evidence with the general surface of the shell of great age; besides this, even if it were possible to produce such a condition in a recently carved shell, there existed no motive for such an attempt. *Nothing was to be made by it, no benefit could accrue to the perpetrator to reward him for his pains, and, further, there was no precedent—there was nothing extant that could serve as a model for such a work.*"*

This is a fair canon of criticism, and if it is effectual to establish the genuineness of this gorget, the same rule of evidence should be extended to the elephant pipes, and it would be found equally applicable and convincing. It is a curious fact, in this connection, that these pipes condemned by Mr. Henshaw were obtained in nearly the same manner and under almost exactly similar surroundings with the "gorgets" which Mr. Holmes pronounces unquestionably genuine. Thus, of the gorgets, one was obtained from unknown persons, and the other was discovered by Dr. E. Palmer, a collector in the employ of the Bureau of Ethnology. So, of the two elephant pipes, one was obtained of a well-known and honest farmer, and the other was discovered in a mound by Rev. A. Blumer, with two assistants as witnesses. As to the inscribed tablets, no less than three well-known and highly respected citizens were present at their discovery. It will thus be perceived that there are stronger evidences to support the authenticity of the pipes and tablets than of the inscribed gorgets. Still, under the high authority of the Bureau of Ethnology, the latter are pronounced genuine, while the former are condemned. Evidently, Mr. Holmes omitted to confer with Mr. Henshaw concerning his important deductions. Had he done so, doubtless he would have been informed by that gentleman, with sententious gravity, that discoveries so important could not safely be received upon the testimony of a single individual; that the very novelty of the discovery rendered it suspicious; and that "archæology could better afford to wait for further and more certain evi-

an exception in favor of Mr. William H. Holmes, who is also engaged in this Bureau. This gentleman, who was formerly connected with the Geological Survey, is an artist of rare accomplishments, and his monograph upon "Art in Shell," which appeared in the Second Annual Report of the Bureau of Ethnology, and another upon "Ancient Pottery of the Mississippi Valley," in Vol. IV. of the Proceedings of the Davenport Academy, are of such singular merit as to fairly entitle him to rank among cultured archæologists.

* Second Annual Report Bureau of Ethnology, 1880-81, p. 303.

dence." With the possibility of this "destructive criticism" impending over his valuable work, it was fortunate for Mr. Holmes that the Director of the Bureau introduced it to the world of science with words of high commendation. In the parallel case of Mr. Gass, it was doubtless equally unfortunate that his valuable contribution to the cause of archæology could not have been likewise announced by so imposing a herald.

Upon the question of the authenticity generally of these Mound-builders' relics, Mr. Holmes advances the following broad and liberal views:

"By accurately ascertaining the authenticity of one of these specimens, we establish, so far as need be, the genuineness of all of the class. If one is genuine, that is sufficient—the others may or may not be so without seriously affecting the question at issue; yet the occurrence of duplicate or clearly related specimens in widely separated localities furnish confirmatory evidence of no little importance."*

Pursuing a similar line of thought, Foster, in his "Prehistoric Races," remarks, concerning the testimony of a single witness to these archaeological discoveries, that

"Those who are most apt to make discoveries in this branch of knowledge.—day-laborers—are the least apt to appreciate their value. It is hardly to be expected that a competent observer will be present at the precise time when any relic of the past is disinterred. If such relics pertain to a horse or any other quadruped, we take the statement of the workman with absolute trust; but if it were to prove of human origin, we discredit it."†

In the absence of all motive to deceive, it is clear that such testimony may safely be received by the scientific inquirer as equally valuable in establishing the genuineness of either class of discoveries. It seems to be the singular thought of Mr. Henshaw that if a solitary explorer discovers anything never before discovered, it must be discredited as suspicious. The limitations he seeks to place around these archæological researches would have been effectual to discredit every such discovery made since the dawn of civilization.‡

* Second Annual Report Bureau of Ethnology, 1880-81, p. 303.

† Foster's "Prehistoric Races," p. 72.

‡ Upon these questions of evidence, Schoolcraft quotes from the "Cosmos" of Humboldt the following wise observations: "Where history, so far as it is founded on certain and distinctly expressed evidence, is silent, there remains only different degrees of probability; but an absolute denial of all facts in the world's history of which the evidence is not distinct appears to me no happy application of philological and historical criticism."—Cosmos, Vol. II., p. 400 ("History of the Indian Tribes of the United States," by H. R. Schoolcraft, Vol. V., p. 27.)

The American Antiquarian Society, also, in a report upon the publications of Dr. Le Plongeon, expressed these liberal canons of criticism: "The successes of Du Chaillu, Schliemann, and of Stanley are remarkable instances of triumphant results in cases where enthusiasm had been supposed to lack the guidance of wisdom. If earnest men are willing to take the risks of

A remarkable circumstance connected with the museum of the Davenport Academy, wherein these pipes and tablets are deposited, is that it has grown up entirely by private contributions. The services of its workers have been rendered gratuitously. Its founders and builders have been solely impelled by the love of science. Its location is far removed from the centers of wealth and power. It has no endowment. It has no laborers for hire. These circumstances are favorable to the genuineness of its discoveries. As no pecuniary reward was expected by its voluntary collectors, a principal motive to the perpetration of frauds is wanting. Its poverty has been its protection, and effectually removes from its museum of relics all well-founded suspicion of deception.

The Smithsonian Institution, on the contrary, has a generous endowment. It is located in the capital of our country, and is the recipient of government aid. The Bureau of Ethnology, while under the management of the Smithsonian Institution, is a part of the United States Geological Survey, and is supported by liberal appropriations. It expends large sums in explorations and in securing additions to its collections. All these circumstances are, doubtless, favorable for advancing its scientific work; and yet, in an important sense, its good fortune may have been its misfortune. Its paid collectors, going up and down the land in quest of valuable relics, may be strongly tempted to magnify their vocations by the practice of shameless deceptions. Its wealth may invite fraud. The modern manufacturer of ancient relics may turn his back upon our mendicant Academy and offer his wares to these scientific capitalists. The circumstances certainly are such as would give rise to suspicion and provoke scrutiny. That the Smithsonian Institution and its Bureau of Ethnology have, to any considerable extent, been victimized by this mercenary spirit, we have no reason to believe, and do not claim. The considerations advanced, however, are legitimate, and will devolve upon its officers the necessity of establishing the authenticity of their own relics. The shafts of criticism so ruthlessly hurled at other gleaners in the same field may turn out to be dangerous weapons, and, after the manner of the ancient boomerang, may, peradventure, return to smite the senders.

It is well known that a large number of the specimens in the National

personal research in hazardous regions, or exercise their ingenuity and their scholarship in attempting to solve historical or archaeological problems, we may accept thankfully the information they give, without first demanding in all cases unquestionable evidence or absolute demonstration." "The North Americans of Antiquity," John T. Short, p. 397.

Museum are without a record, and as to some of them, suspicions may, not without reason, be entertained as to their authenticity. In the paper of Mr. Holmes, the reader will not have failed to notice his frequent references to these unfortunate circumstances. Thus, of the shell gorget, entitled "The Bird," he remarks: "The gorget in question is, unfortunately, without a pedigree;"* and of another, entitled "Profile of an Eagle's Head," he makes this emphatic statement: "Like so many of the National Museum specimens, it is practically without a record—a stray." It is, doubtless, because of these imperfections in its collections that its management has grown distrustful, and has come to consider the policeman as essential as the collector in making these explorations. Prof. Baird himself, in his letter of March 17th, 1880, gives pathetic expression to this forlorn state of feeling, as follows:

"I must confess to a very considerable degree of incredulity in regard to the wonderful 'finds' of Mr. Gass. *It is very remarkable that so many should fall into the hands of one person.* Is it not possible that somebody has interested himself in deceiving Mr. Gass, and, through him, the archaeologists of the Northwest? We have detected a series of most clever forgeries in stone as perpetrated by parties living in Eastern Pennsylvania. They were entirely too good and too remarkable not to excite criticism, which has resulted, I think, in proving their falsity. *We shall soon begin to suspect everything that is out of the routine average of American stone implements.*"

As with Major Powell and Mr. Henshaw, it will be observed that Prof. Baird gives no reason for his "incredulity," other than that it is remarkable that so many discoveries had been made by "one person." The answer of the Corresponding Secretary to this letter contained the sufficient explanation that the success of Mr. Gass was wholly due to his zeal, perseverance, and vigorous use of the spade. The fact that enterprising parties in another part of the country, with a greedy eye on appropriations, had established a manufactory of stone implements for the supply of the Smithsonian Institution, cannot be seriously advanced as an argument against the authenticity of the Davenport relics. In the latter case, no question of profit intervenes, and there is an entire absence of all motive to deceive.

In introducing to the public Mr. Henshaw's paper, and those accompanying it, Major Powell makes use of the following emphatic language: †

* "Art in Shell," Second Annual Report Bureau of Ethnology, 1880-81, pp. 282-285.

† Second Annual Report Bureau of Ethnology, 1880-81, p. xxvi., Introductory.

"Each of the papers appended to this report has its proper place in the general scheme, the scope of which they, together with the other publications before noted, seem to indicate, and each was prepared with a special purpose."

In the light of this announcement, it will be instructive to carefully read, in connection with the monograph of Mr. Henshaw, that of Mr. Holmes, to which reference has already been made. In describing their respective discoveries, they were compelled to traverse the same ground. The shells under consideration by Mr. Holmes were also relics of the Mound-builders. Among these remarkable relics recovered from ancient mounds were engraved gorgets. These shells were probably worn about the neck or on the breast. In another department they were the complements of our "inscribed tablets," and were discovered in similar tumuli in other parts of the country. On them are represented the cross, birds, spiders, serpents, and the human face and form. By a series of comparisons with Mexican and Peruvian art, Mr. Holmes traces the origin of these interesting relics to the Aztecs of ancient Mexico. The concluding thoughts of Mr. Holmes are as follows:*

"As an ornament, this Missouri gorget is a member of a great family that is probably northern; but the design engraved upon it *affiliates with the art of Mexico*, and so close and striking are the resemblances that accident cannot account for them, and *we are forced to the conclusion that it must be the offspring of the same beliefs and customs and the same culture as the art of Mexico.*"

These conclusions of Mr. Holmes appear in singular contrast with the labored effort of Mr. Henshaw to disprove the Mexican origin of the animal carvings found in the mounds; and, with all due deference to Major Powell, the perplexed reader will find it difficult to discover a "proper place" for these two important papers in any "general scheme." A popular scientific magazine thus refers to these conflicting deductions:†

"It seems almost aggravating that in the same volume wherein Mr. Henshaw [denies]‡ and effectually disproves the Mexican origin of many animal forms in the mound-pipes, new forms should be described, concerning which the author says that they 'must be the offspring of the same beliefs and customs and the same culture as the arts of Mexico.'"[§]

*Second Annual Report Bureau of Ethnology, 1880-81, p. 305.

†*American Naturalist*, September, 1884.

‡ Misprint.

§ Major Powell himself was evidently impressed with this remarkable parallel, drawn by Mr. Holmes, between the relics from the mounds and the art of Mexico; and, in presenting this masterly monograph to the public, as if feeling the necessity of tempering it to some show of consistency with his own theories, the Director thoughtfully adds the following reservation:

In now bringing these notes to a close, it is, perhaps, no more than justice to Mr. Henshaw to state that in his attack upon the authenticity of the relics in question he does not stand alone, but is ably sustained by the Director of the Bureau. In his introductory chapter, Major Powell writes as follows:

"It will be the duty of the Bureau of Ethnology to devote careful attention to this interesting field of archæology. But *those who have hitherto conducted these researches* have betrayed a predetermination to find something inexplicable on the simple hypothesis of a continuous Indian population, and were swept by blind zeal into serious errors, *even when they were not imposed upon by frauds and forgeries. Some of the latter, consisting of objects manufactured for sale to supply the manifested craving after the marvelous, and even inscribed tablets suggesting alphabetic or phonetic systems, have recently been exposed by the agency of this Bureau.*" *

This was the first information given to the public that any such "frauds and forgeries" had "recently been exposed" by the Bureau, and we look in vain through its publications for the details of these alleged extraordinary exposures! As in the case of Mr. Henshaw, it will be noticed that these extravagant denunciations of the relics in the Davenport Academy are made by Major Powell without reference to a particle of evidence to sustain them, or even the suggestion of a suspicious circumstance in connection with them. But we have as fellow-sufferers the grand company of archæologists the world over, for the Director of the Bureau, while he discredits our relics, also condemns the work of all "who have hitherto conducted these researches." None so worthy as to escape his denunciation!

Before closing this paper, it will be instructive, in connection with this "new departure" of the Bureau of Ethnology, to recall the curious circumstance that the first publication ever made by the Smithsonian

"A deduction, *not made by the author*, may, perhaps, be suggested by the comparison from the art and literature furnished by him, to the effect that *the artistic methods of the Mound-builder are traceable among the historic tribes of North America, tending to show that*, contrary to the once current belief, based exclusively on the same evidence, *there is no marked racial distinction between them.*" Major Powell is quite right in saying that this is "*a deduction not made by the author.*" When, on the contrary, it is observed how directly it conflicts with the conclusions of Mr. Holmes, as stated in the above paragraph, it affords an amusing illustration of the eagerness of the accomplished Director to maintain his theory.

*Second Annual Report Bureau of Ethnology, 1880-81, pp. xxxi.-xxxii., Introductory.

The severity of the language italicized can only be fully appreciated by reference to the paper of Mr. Henshaw, which Major Powell thus introduces and endorses. In that paper Mr. Henshaw makes direct mention of the Davenport Academy, and selects the relics in question for condemnation. Major Powell, therefore, clearly aims his shafts at these relics, and having consigned the "pipes" to a commercial hell, looks about for some lower deep for "even inscribed tablets!" If this is the standard of criticism, and these the critics, explorers may well hesitate before exposing their heads above an opened mound to be pelted with maledictions by archæologists in high places, and may deem it prudent to engage in some less perilous pursuit.

Institution was the great work of Squier and Davis, entitled "Ancient Monuments of the Mississippi Valley." In this work an exactly opposite theory from that held by Major Powell was confidently advanced and strongly supported. The reader will not have failed to notice that a considerable portion of Mr. Henshaw's paper is devoted to an attempted refutation of their important deductions. In contrasting the views of Squier and Davis as to the origin of the Mound-builders with those advanced by Major Powell, as clearly presented in the opening extracts of this paper, the reader will be struck with the extent of the divergence between the earlier and later deductions. Equally at variance are the views expressed by Squier and Davis and those of Mr. Henshaw upon the subject of ancient art. As to the degree of artistic skill possessed by the Mound-builders, the former thus state their views:*

"Such is the general character of the sculptures found in the mounds. It is unnecessary to say more than that as works of art they are immeasurably beyond anything which the North American Indians are known to produce, even at this day, with all the suggestions of European art and the advantages afforded by steel instruments. The only fair test of the relative degree of skill possessed by the two races would be in comparison of the remains of the mounds with the productions of the Indians before the commencement of European intercourse. A comparison with the works of the latter, however, at any period, would not fail to exhibit in striking light the greatly superior skill of the ancient people."

In opposition to these conclusions of Squier and Davis, Mr. Henshaw makes this emphatic statement of his own views:†

"Eminent as is much of the authority which thus contends for an artistic ability on the part of the Mound-builders far in advance of the attainments of the present Indians in the same line, the question is one admitting of argument, and if some of the best products of artistic handicraft of the present Indians be compared with the objects of a similar nature taken from the mounds, it is more than doubtful if the artistic inferiority of the latter-day Indian can be maintained."‡

*Smithsonian Contributions to Knowledge, Vol. I., p. 272.

†Second Annual Report Bureau of Ethnology, 1880-81, p. 123.

‡The fact has been fairly assumed throughout this paper, based upon repeated and emphatic utterances, that Major Powell and Mr. Henshaw, in seeking for the artisans of these mound-relics, exclude the Toltec and Aztec races, and adopt the theory that these ancient sculptures are the artistic handicraft of the ancestors of the Indian tribes at present within the limits of the United States. While it is doubtless true that all the aborigines found on the American continents by the discoverers were designated as "Indians," an obvious distinction may still be made between the semi-civilized races then inhabiting Mexico, Central and South America, and the wild, wandering tribes found within the limits of the United States, and at that date frequenting the region of the mounds. In referring to this distinction, Baldwin remarks: "People of the ancient Mexican and Central American race are not found farther north than New Mexico and Arizona, where they are known as Pueblos, or Village Indians. In the old time *that* was a frontier region, and the Pueblos seem to represent ancient settlers who went there from the south. *There* was the border line between the Mexican race and the wild Indian, and the distinction between the Pueblos and the savage tribes is every way uniform and so great that it

It thus becomes quite evident, from this review, that it is a principal object of the present management of the Smithsonian Institution, through its Bureau of Ethnology, to reëxamine these early explorations of Squier and Davis, and to reconsider, and, if possible, reverse, their important deductions.

The work of Squier and Davis was issued by the Smithsonian Institution, in 1847, as the first of its "Contributions to Knowledge." As its publication was to be the inauguration of that great enterprise, unusual care and caution were observed in the examination into its scientific merits and deciding upon its acceptance for publication. The work was well received by the illustrious Joseph Henry, then Secretary of the Smithsonian Institution, and was by him referred to the American Ethnological Society, of New York, for further examination. The favorable report of that institution was subscribed with such respectable names as Albert Gallatin, John R. Bartlett, George P. Marsh, Samuel C. Morton, Edward Robinson, and W. W. Turner. The proposed publication of this important work was still further approved by the American Academy of Arts and Sciences, and is mentioned with approbation in a report made on December 7th, 1847, to Prof. Henry, by a committee embracing such notable names in American scholarship as Edward Everett, Jared Sparks, Benjamin Pierce, Henry W. Longfellow, Asa Gray, and O. W. Holmes. Thus strongly recom-

is well-nigh impossible to believe they all belonged to the same race. In fact, no people like our wild Indians of North America have ever been found in Mexico, Central America, or South America." In claiming for these "wild Indians" a degree of semi-civilization and artistic skill equal to, if not beyond, that displayed by the Mound-builder, Major Powell finds himself in good company: Schoolcraft, Lapham, Brinton, Lucien Carr, and a large number of cultured archaeologists adopt the same view. In his work upon the "Mounds of the Mississippi Valley," Mr. Carr has carefully collected, in a note on page 4, the authorities supporting this Indian theory, and Mr. Dall has incorporated this note into his recent edition of Nadaillac's "Prehistoric America," pp. 131-132. This list embraces the names of many eminent scholars and carries with it a great weight of authority. On the other hand, however, we find arrayed in support of the theory that the Mound-builders were a distinct race from the Red Indians, and of a higher grade of civilization, the great names of Squier and Davis, Morgan, Morton, Harrison, Prescott, the Bancrofts, Baldwin, Foster, Winchell, Peet, MacLean, Short, Whittlesey, Joseph Jones, Vining, with many other profound scientists in this country and Europe. It is to this great company of cultured archaeologists that Major Powell refers when he says: "Those who have hitherto conducted these researches have betrayed a predetermination to find something inexplicable, on the simple hypothesis of a continuous Indian population, and were swept by blind zeal into serious errors." And because of these alleged repeated and momentous failures, Major Powell consoles the world of science with the assurance that, in future, "it will be the duty of the Bureau of Ethnology to devote special attention to this interesting field of archaeology!" While the weight of argument and authority, however, appears to be on the opposite side, and in favor of a Mexican origin for the Mound-builder, it must be conceded that the question is still an open one. ("Ancient America," by John D. Baldwin, pp. 217-218; "Mounds of the Mississippi Valley;" "Memoirs of the Kentucky Geological Survey," Vol. II., 1883; "Prehistoric America," by Marquis de Nadaillac, p. 131, note 3.

mended, the work of Squier and Davis made its appearance under the auspices of the Smithsonian Institution.* It was everywhere well received. Since that date it has been the principal authority in American archaeology, and the most considerable storehouse of ethnological information. It has given direction to a generation of scientific workers. Its important deductions have permeated the thought of the best scholars and most profound thinkers throughout our own and foreign lands.†

Under a new management, the Smithsonian Institution has undertaken to reconsider this great work of Squier and Davis, and aims to refute its important deductions. It seems to have been recently discovered that in its publication that institution has not been engaged in the "diffusion of knowledge" at all, but instead, during all these years, has been scattering error broadcast through the land. We are, therefore, called upon to retrace our steps, to unlearn the lesson we have so long conned, and to take our places at the feet of strange teachers. This is certainly discouraging to American scholarship, and the thoughtful student will wisely pause and make careful inquiry as to which, after all, is error — the earlier or the later deductions.

Still, it must be conceded, if the statements of the great work of Squier and Davis are unreliable, and its deductions without sufficient basis, these defects cannot be too early disclosed to the world of science. Such an exposure would be a benefaction to the cause of truth. The attempt to reverse the thought of an age is, however, a most notable undertaking. It needs great courage, excellent scholarship, and a commanding name. It will, of course, be taken for granted that the man called to so important a work must have been long engaged in archaeological research, trained in its methods of investigation, and familiar with its literature. We recall the names of noted archaeologists, and wonder who among them would have the temerity to engage in this gigantic undertaking. In response to our summons none such appear; but, instead, the Director of the Bureau steps promptly to the front and makes due announcement of "Henry

* Eighth Annual Report Smithsonian Institution, pp. 133-147.

† It is reasonable to conclude that Professor Baird, of the Smithsonian Institution, never saw the paper of Mr. Henshaw previous to its publication. Had it been subjected to the scrutiny of this eminent and profound scholar, its careless statements and loose deductions would assuredly have met his condemnation and prevented its unfortunate publication. The Secretary of the Smithsonian Institution will doubtless find it necessary to exercise a more careful supervision over the publications of the Bureau of Ethnology, and to subject them to somewhat of that severe scrutiny employed when the valuable work of Squier and Davis was accepted for publication.

W. Henshaw" as the champion of his theory; and this is the method of his introduction:

"Mr. H. W. Henshaw, skilled as a naturalist, especially as an ornithologist, and familiar by personal experience with a large part of our national territory, was led to examine into the truth of these statements, repeated from author to author without question or criticism, and used as data in all discussions on the mounds. The result is the important paper now published. His conclusions, from the evidence adduced, seem to be incontrovertible."*

And so the valiant gentleman appointed to displace Squier and Davis is a new-comer in archaeology, but, nevertheless, is "skilled as a naturalist, especially as an ornithologist;" and, moreover, is "familiar with a large part of our national territory!" With this unique statement before us of Mr. Henshaw's qualifications for his great work, comment would be superfluous. The recommendation is itself a condemnation. The scientific world will scarcely consent to so summary a displacement of its old worthies, at the behest of a newly-fledged archaeologist, even though he may be "skilled as a naturalist!" With the dethronement of Squier and Davis, it followed, as a logical necessity, that, in a more lowly sphere, our Mr. Gass must be decapitated. Each act was an essential factor in the same "general scheme." We have here the full force of Major Powell's significant announcement that Mr. Henshaw's effort was "a successful destructive criticism!" It would, perhaps, have been more prudent, before pronouncing it "successful," to have awaited the verdict of the large company of cultured archaeologists throughout the world of science, who, in the last resort, must pass upon the merits of this controversy.

We cannot better take our leave of Mr. Henshaw than by quoting from the *American Naturalist* the following humorous account of his ludicrous production: †

"Just as in a hurdle race the crowd gathers at the wicket to see the horses make the leaps, so the archaeologists will be anxious to know how Mr. Henshaw gets over some of our archaeological hedges and ditches. Well, the first animal to block the way is the manatee, and all will agree that the leap is effective. The next myth attacked is that relating to the toucan, and what is left of it 'is easy of identification.' The bird is a common crow, or a raven, and is one of the most happily executed of the avian sculptures. The paroquet is treated more kindly, this species having abounded in the Mississippi Valley; but the particular paroquet of Squier and Davis is made to step aside. Passing over the remarks upon various well-known forms and the skill shown in the carving, we come to Mr. Henshaw's attack upon

*Second Annual Report Bureau of Ethnology, 1880-81, p. xxxii., Introductory.

† *American Naturalist* for September, 1884.

the elephant mound, concerning which he doubts whether an effigy without ears, tail, tusks, or extended trunk can stand for a mastodon. *The author throws discredit upon the authenticity of the elephant pipes.**

To the Davenport Academy, however, the flippant criticism of Mr. Henshaw has more serious import, and, uncontradicted, it might inflict irreparable injury. It has been well remarked, "that not the least misfortune of a prominent falsehood is the fact that tradition is apt to repeat it for truth." Shielded under the respectable name of the Smithsonian Institution, Mr. Henshaw insinuates his slanders into the ear of the world. Not by a frank and open statement, with good reasons assigned, does this "naturalist" condemn our elephant pipes and accuse their discoverer; but, as seeking to escape responsibility, with a nod and a wink, he merely hints, as it were, in a sly whisper, "that their authenticity as specimens of the Mound-builder's art has been seriously called in question." Thereupon a prominent scientific journal, caught in the snare, innocently takes up the whispered story and reports to the vast company of its readers that Mr. Henshaw, an accredited representative of the Bureau of Ethnology, "throws discredit upon the authenticity of the elephant pipes!" and this without a word of disapproval of its base and unfounded insinuations. Nor is this all. We have before us the work upon "Prehistoric America," by the Marquis de Nadaillac, just issued from the press, and therein we find this reference to the relics in question:

*"Quite recently, in Iowa, a pipe has been found, made of rather soft sandstone, which is claimed to represent an elephant. It is to be observed, however, that such identifications generally owe much to the natural desire to recognize something strange or unusual, and also to the want of a sufficient knowledge of natural history. A recently published investigation of bird-pipes and carvings, by a well-known ornithologist, has resulted in demolishing the foundation of much theorizing which has been based on the identical specimens examined. Forgeries are also too common."**

And the distinguished author gives as his authority for these strong statements, "H. W. Henshaw. Second Annual Report Bureau of Ethnology, Washington, 1884." The mischief is now done. The "de-

* "Prehistoric America," by Nadaillac, pp. 161-162. From the fact that the above reference to the elephant pipes has no appropriate setting in the text, it may be reasonably set down as an interpolation by the American editor. It gives occasion for surprise that so excellent an archæologist as Mr. Dall should thus have given a prominent place in scientific literature to statements of so great importance without careful verification. In an excellent review of this work, the *Nation* thus notices the want of harmony between its author and editor: "Availing himself of the liberty judiciously allowed him as editor, Mr. Dall has not only rewritten the chapter (X.) on the origin of man in America, but he has so 'modified and revised' other portions of the work as to lead to conclusions that were but little dreamed of in the original publication."

Nation, March 12th, 1885.

structive" work, commended by Major Powell, seems complete. The unsupported accusation is caught up with avidity, passed from writer to writer, from paper to paper, from book to book, gathering volume in its passage, until at length, having attained portentous proportions, the fiction may pass into history as fact. The fiction is thus fairly launched on its journey round the world and down the years. It has been said, though in somewhat homely phrase, "that a lie will travel from Maine to Georgia while truth is stopping to put on his boots," and though these should prove the "seven-league boots" of the nursery tale, it is doubtful whether the falsehood can ever be overtaken and wholly overcome. The history of archaeology itself is replete with instances of similar wrongdoing, some of which, like that of the late Dr. Koch, of Missouri, are full of almost pathetic interest. Because of his labors for science, this enthusiastic explorer was subjected to a most "destructive criticism" until his life went out in gloom; and now, at this late day, a distinguished archaeologist renders him this tardy but well-deserved justice:

"Unfortunately, Koch's want of scientific knowledge and the exaggerations with which he accompanied his story, at first threw some discredit upon the facts themselves. But the recent discoveries of Dr. Aughey, in Iowa and Nebraska, have now confirmed them. There, too, the bones of the mastodon have been found mixed with numerous stone weapons; and man, we learn to our surprise, armed with these feeble weapons, not only did not fear to attack the gigantic animal, but succeeded in vanquishing it."*

The student in science will also recall the parallel case of M. Boucher de Perthes, in France, who, for years after his remarkable discoveries at Abbeville, saw them discredited, and found himself regarded not only as an enthusiast, but almost as a madman. But his deductions are now generally accepted; and there is no more impressive scene in the history of science than that presented when, some fourteen years after the publication of his first work, he stood on the spot of his exploit, with representatives of the French Academy and the Royal Society of England, and received their plaudits over his great discovery. It may well be questioned whether progress in science has not been greatly retarded by the unreasonable incredulity of its votaries. Not only in religion, but in the pursuits of science as well, we too often find a stolid adherence to old traditions. The religious intolerance that burned Bruno and the scientific intolerance that persecuted Koch had a common origin. With altered environments, the fanatic who saw only

* "Prehistoric America," by Nadaillac, p. 37.

"heresy" in Bruno's great thoughts, and the scientist who saw only "fraud" in Koch's great discovery, might easily have exchanged places.*

This discussion gives prominence to another question of no ordinary importance, and that is as to the value of local organizations throughout the country in facilitating archæological research. The Bureau of Ethnology not only seems to regard them with disfavor, but makes no secret of its hostility to these independent methods of research. It is clearly contemplated that all these local organizations should be resolved into mere conduits to the Smithsonian Institution; that all explorations of mounds and earth-works should be under the direction of its Bureau of Ethnology; and that all relics obtained should be deposited for safe-keeping in the National Museum.† This certainly is a notable scheme; difficult, however, of execution, and of doubtful wisdom.

* Lubbock's "Prehistoric Times," pp. 342, 343, 351. Concerning the great discoveries at Abbeville, this distinguished author remarks: "We cannot, therefore, wonder that the statement by Mr. Frere has been distrusted for more than half a century; that the weapon found by Mr. Conyers has lain unnoticed for more than double that time; that the discoveries by M. Boucher de Perthes have been ignored for fifteen years; that the numerous cases in which caves have contained the remains of men together with those of extinct animals have been suppressed or explained away. These facts show how deeply rooted was the conviction that men belonged altogether to a more recent order of things; and, whatever other accusation may be brought against them, geologists can at least not be said to have hastily accepted the theory of the co-existence of the human race with the now extinct pachydermata of Western Europe."

† That this statement is not overdrawn will be made evident by reading the description of the National Museum, by Ernest Ingersoll, in the *Century* for January. Commenting upon that article, *Science* remarks: "Mr. Ingersoll develops the grandeur of the scheme with a lavish hand, and it would appear as if, were the plan to be carried out in detail, the District of Columbia would not be large enough to hold the Museum." Nor does the enterprise of the gentlemen of the Smithsonian Institution stop here! Major Powell, Director of its Bureau of Ethnology, recently gave some important testimony before a joint committee of both Houses of Congress, wherein he recommended that "all the scientific institutions of the Government should be placed under one management," and expressed the opinion that "if such of the scientific bureaus as should properly have a civil organization were placed under the direction of the regents of the Smithsonian Institution, perhaps the best possible administration of the scientific work of the Government would thereby be secured." The consolidation, under the management of the Smithsonian Institution, thus recommended by Major Powell, embraces the Fish Commission, the National Museum, the Geological Survey, the Bureau of Ethnology, and about everything else, now scattered among the various departments, having any relation to science, literature, and art. It reveals a gigantic scheme, and it may be questioned whether any single management could be equal to its proper requirements. A valuable report was also submitted under the same subject by a committee of the National Academy of Sciences, consisting of General Meigs and Professors J. P. Trowbridge, Pickering, Young, Walker, and Langley, wherein the following more moderate views were expressed: "We conceive it to be a sound principle, that Congress should not undertake any work which can be equally well done by the enterprise of individual investigators. Our leading universities are constantly increasing the means of scientific research by their professors and students, and while the Government may with propriety encourage and co-operate with them, there is no reason why it should compete with them. The scientific work of the Government ought not, therefore, to be such as can be undertaken by individuals." (*Science*, January 2d and 16th, 1885.)

This was not the spirit manifested by the late Joseph Henry, when in charge of that Institution. In the Smithsonian Report for 1875, Prof. Henry thus states his views:

"It has been, from the first, the policy of this Institution to encourage the establishment of such societies, on account of the great advantage they are to their members in the way of intellectual and moral improvement, as well as in the way of positive contributions to science." *

It cannot be denied that these small organizations, scattered through the land, are doing excellent service in the cause of science. Being located in their midst, they are thus brought close to the heart and thought of the people. Their stated meetings attract persons of scientific tastes and scholarly acquirements. The wonders of the past and the worth of science are thus revealed. They inspire enthusiasm in archæological research and an unflagging zeal in its prosecution. They thus become powerful auxiliaries to scientific education. Their growing museums will first attract young eyes to admire, and then retain them to study. Mere relic-hunting soon becomes serious archæological research. Out of these practical schools of the people will come the great scientific students of the future. The work in these small societies is all the more valuable that it is entirely disinterested. Truth is its inspiration and reward. Watched by so many curious eyes, frauds are well-nigh impossible. We have thus presented important services rendered to science by these "local societies" which no gigantic institution, located at the political capital of our country, and managed by salaried officers, could, by any possibility, have so well performed. We think we may claim, without unseemly arrogance, that the history of the Davenport Academy itself reveals some contributions to science which will justify its existence.†

Scholars will ever find an absorbing interest in archæological research. There is in the mind of man an innate craving to recover the secrets of the past, and brooding in the thought of the explorer is the confident expectation that in these ancient relics will yet be found

* Smithsonian Report for 1875, pp. 217-219.

† The conclusions stated in the text are amply justified by the facts. The Davenport Academy is not only assailed by name, but it is plainly expressed that its discoveries are under ban, and that its exploration of ancient mounds should be discontinued, inasmuch as each fresh discovery "*will be received with ever-increasing suspicion.*" Had our critic been kindly disposed, his censure might have been more gently administered. He might have admitted the possibility of our being deceived and not deceivers. He could have easily attributed our short-comings to our benighted location on the far banks of the Mississippi, so distant from the Bureau of Ethnology! Our critic, however, is pitiless. He has studied the Indian character until he seems to have imbibed his nature! We are pelted with red-hot epithets! Nothing will satisfy his "destructive" appetite, unless our Mr. Gass puts aside his spade!

indelible traces of ancestry or undoubted remains of ancient civilizations. In the view of the Director of the Bureau, it is true, "working naturalists postulate evolution,"* and he deprecates the "search for an extra-limital origin" for the ancient races of North America. It would seem, therefore, that he proposes to work out upon our own continent the problem of man's origin and existence. Those of us, however, who still hold to the orthodox belief in the unity of the race, will continue to indulge in the conjecture that sometime, somehow, somewhere, by adventurous barque of some ancient mariner, by bridge of ice at the north, or by a lost Atlantis at the south, a pathway was opened, and the original progenitors of the races found on this continent by the discoverers made their way from the great centers of populations in the far orient.† Be this as it may, so far as the ancient works of art under consideration are concerned, it matters little whether they be traced to the ancestors of our present Indians, thus showing decadence in the race; or to the Toltec or Aztec of ancient Mexico, thus indicating that, with their migrations southward, they evolved a higher civilization. There is nothing in either theory, or in all of them, to require or justify the "destructive criticism" visited upon the Davenport Academy and its members.‡

The researches of anthropologists as to the origin and antiquity of

* "Origin of Man," J. W. Powell, First Annual Report Bureau of Ethnology, 1879-80, p. 77.

† The concluding chapter of Nadaillac's "Prehistoric America" is contributed by the American editor, Mr. Dall, and his conclusions, as therein stated, are among the most reasonable yet advanced. He thus states his views: "Squier, Gibbs, and numerous American ethnologists, believed in a migration from the west to South America. A northern migration is almost universally considered to have taken place. Probably the American races entered by both gates." And in the same connection he further remarks: "That America was peopled at different times, by scions of different races, is highly probable, from the physical differences to be observed between the remains of prehistoric man and the complexion and features he bequeathed to his historic descendants." ("Prehistoric America," by Nadaillac, pp. 523, 531.)

‡ In concluding this vindication of the Davenport Academy from the unfounded accusations of the Bureau of Ethnology, we desire to express our high appreciation of the great ability and large acquisitions of its Director, Major Powell, and of the valuable contributions he has made to the cause of science. The careless supervision of the work of subordinates, which permitted the publication of a paper so void of merit and so full of blunders as the one in question of Mr. Henshaw, as well as the endorsement of its statements and deductions without careful verification, must, no doubt, be set down as among the mistakes of an overburdened man. By the consolidation of the Government Surveys in 1879, Major Powell became the Director of this great work, and when, at the same time, the Bureau of Ethnology was established, under the charge of the Smithsonian Institution, he was also appointed the Director of that department. It will, therefore, occasion no surprise that he is left little opportunity for calm and careful supervision of the scientific work of his assistants. This fact becomes still more apparent, when it is considered that, superadded to the proper work of these departments, the executive management also devolves upon Major Powell important and absorbing political duties. The exacting nature of the duties which devolve upon the "political scientist" are graphically portrayed in the *Nation* for August 26th, 1883.

the American aborigines, while they leave the problem unsolved, have yet an important bearing upon the interesting questions suggested by this discussion. Learned and careful investigators, both in this country and Europe, have not hesitated to confront biblical chronology with their bold speculations, and a brief statement of some of the more important of these new theories may tend to throw light upon the subject of our inquiry:

"A vast deal has been written in support of various hypotheses of the migration of the American aborigines from the old continent, and there is hardly a country or a race which has not been assigned the honor of being its progenitor; and to complicate matters still more, there have not been wanting high authorities to suggest that the tide of emigration may have set the other way, from America to Asia. Dr. Latham says: 'I know reasons valid enough and numerous enough to have made the notion of the new world being the eldest of the two a paradox; nevertheless I know no absolutely conclusive ones.' As the new world, so-called, is the oldest geologically, it may prove to be so ethnologically." *

"In the classification of Blumenbach, the American Indians are treated as a distinct variety of the human race; but in the three-fold division of mankind laid down by Dr. Latham, they are ranked among the Mongolidæ. Other ethnologists also regard them as a branch of the great Mongolian family, which, at a remote period of the world's history, found its way from Asia to the American continent, and there remained for thousands of years, separate from the rest of mankind, passing meanwhile through various alternations of barbarism and civilization. Morton, however, the distinguished American ethnologist, and his disciples, Nott and Glidden, claim for them a distinct origin, one as indigenous to the continent itself as its fauna and flora." †

"It may be asserted with some confidence that there is nothing in the physical and mental condition of the aboriginal Americans which requires us to postulate for them a foreign origin. If man was evolved originally from several centers, America assuredly included one at least; if he sprung from a single pair, then we can even conceive that pair to have been first established in the new world; and the arguments brought forward in support of an Asiatic origin of the American would not lose their point if adduced in favor of an American origin of the Asiatic peoples." ‡

"Dr. Augustus Le Plongeon is satisfied that Egyptian civilization originated on the American continent, and he is in possession of a vast number of evidences which he believes fully establish this extraordinary theory. One of these is the resemblance between the Egyptian and the Maya alphabets as derived from the monumental remains of the two systems." §

These curious speculations seem to establish the great antiquity of man in America, and thus are not unconnected with the scientific

* New American Cyclopaedia, Vol. IX., p. 488, title "Indians."

† Chambers' Cyclopaedia, Vol. V., p. 554, title "Indians."

‡ Encyclopaedia Britannica, 9th edition, p. 822, title "American Indians."

§ *Scientific American Supplement*, January 31st, 1885.

problems suggested by the discovery of our remarkable relics. Thus, assuming the correctness of any one of them — take it as established, for instance, that the American aborigines were indigenous on this continent; let it be conceded that these aborigines were the ancestors of our Red Indians, and identical with the Mound-builders; consider them, even as Major Powell desires, hewers of wood, tillers of the soil, and skilled workmen in stone; and then let the archæologist tell us what scientific possibility or probability would be violated should we claim this ideal Indian as the artist who carved our pipes and traced our tablets? In the last analysis it will be found there is nothing anomalous in these relics. They are in harmony with the results of recent research. They are links in the chain of evidence uniting the carving in the cave of La Madeleine with our own elephant pipes and inscribed tablets. They have been long foretold by our best investigators, and their discovery only fulfills a prophesy of science.*

We regret the occasion which has made necessary this defense of our Academy against a most unjust assault.† Many words of cheer came to our young society from the illustrious and lamented Henry, while he was in charge of the Smithsonian Institution; and we can now regard the Institution he has left behind him only with admiration, as the emanation of his broad intelligence. The great vacancy occasioned by his death has been well filled by Prof. Baird, and it is fortunate for the cause of science that so capable and scholarly a successor was found to take up and carry on the important work so auspiciously commenced. The Smithsonian Institution easily takes its

* "We know that both these great monsters — the elephant and the mastodon — continued to inhabit the interior of our continent long after the glaciers had retreated beyond the upper lakes, and when the minutest detail of surface topography were the same as now. This is proven by the fact that we not unfrequently find them imbedded in peat in marshes which are still marshes, where they have been mired and suffocated. It is even claimed that here, as on the European continent, man was a cotemporary of the mammoth, and that here, as there, he contributed largely to its final extinction. On this point, however, more and better evidence than any yet obtained is necessary before we can consider the contemporaneity of man and the elephant in America as proven. *The wanting proof may be obtained to-morrow, but to-day we are without it.*" Hayden's Geological Survey, 1871. "The Ancient Lakes of Western America," by Prof. J. S. Newberry, p. 338.

† The attack made upon the Davenport Academy by the Bureau of Ethnology was wholly unexpected. The paper of Mr. Henshaw has been written for several years, and yet, until the recent distribution of the volume containing it, the officers of the Academy had received no intimation that such an accusation was impending over it. We have been accused, convicted, and sentenced without opportunity of defense. This extraordinary proceeding occasions the greater surprise from the fact that our Academy is under great obligations to the Smithsonian Institution, both under the former and present administrations, for especial favors. Through it our foreign exchanges have been made, and we are indebted to it for large additions to our library. We therefore take this occasion to distinguish between that Institution and its "destructive" Bureau of Ethnology.

place among the great scientific organizations of the world — with the Academy of France or the Royal Society of England. It is its noble mission to encourage original research and give proper direction to the scientific thought of our country. It will best subserve this great purpose by sternly observing in its discussions the dignity and decorum of high scholarship, the serene and catholic spirit of true science.

In submitting this refutation, we have sought to avoid scientific discussion, and have carefully abstained from taking part in the war of rival theories. It has been our object to clear our unique relics from all taint of suspicion, and so to present them to the scientific world for careful study. Upon experienced archaeologists will devolve the duty of tracing resemblances and deciphering inscriptions; and to them will belong the privilege of determining their age and origin, and of announcing their scientific significance and value. In themselves perhaps insufficient to become the basis for positive deductions, these relics must take their place with other discoveries until that "good time coming," when the basis of fact shall be deep and broad enough to allow the opening of another page in the "unwritten history" of our earth and race.

The purpose of this paper will have been accomplished, if we have succeeded in vindicating a generous and worthy man from foul aspersions; our young and growing Academy from the stigma of participation in a disgraceful deception, and our unique and valuable relics from all reasonable ground for suspicion.

CORRESPONDENCE.

The foregoing paper upon "Elephant Pipes and Inscribed Tablets" was widely distributed, and elicited an extensive correspondence. Many of these letters, from well-known archaeologists and other noted scientists in this country and Europe, on account of the important questions involved, possess great scientific value. Our limited space will permit us to do no more than present some selections and extracts from these valuable communications. Generally this is done with the express consent of the writers. In a few instances, views favorable to the positions assumed by our Academy have been expressed by archaeologists entitled to speak with authority, who were unwilling to have their names appear in this controversy. While we regret their undue caution, we can do no otherwise than respect their wishes. In only two or three instances have unfavorable responses been received, and, in order that both sides may fairly be presented, these will be included. Our correspondents are alone responsible for the statements contained in their communications.

From DR. EDWIN HAMILTON DAVIS, Author of "Ancient Monuments."

[In connection with the fact that the Bureau of Ethnology, in its report under review, has controverted statements and endeavored to reverse deductions made by Squier and Davis in their great work on "Ancient Monuments of the Mississippi Valley," the following communication from one of its distinguished and venerable authors will be read with peculiar interest.]

NEW YORK, May 28th, 1885.

CHAS. E. PUTNAM, ESQ.—

Dear Sir: I have read with peculiar interest your masterly vindication of the authenticity of the pipes and inscribed tablets in the Davenport Museum. I consider it a triumphant refutation of the accusations of Mr. Henshaw and the absurd theories of the Bureau of Ethnology in the Smithsonian Institution. Please accept my thanks for your good opinion and defense of the general views set forth in the "Ancient Monuments."

One would naturally suppose that such an institution as the Smithsonian would take great care to guard the reputation of such works as it stands God-father to by publishing them in its transactions; especially not to accept and publish captious, unjust, and even false criti-

cisms of its own publications. But I am sorry to say that it has shown great indifference, and sometimes even culpable neglect, in this matter. As an instance, I would mention that, some years since, Sir John Lubbock published, in an English journal, a review of the "Ancient Monuments," in which he described all the sculptured stone pipes found in the mounds under the head of *pottery*. The Smithsonian Institution republished this paper, with its stupid blunder, without comment or correction, in the Report for 1862; which led Sir John, and the rest of the world, to suppose that his statement was correct. I remonstrated with Prof. Henry, who sent me an apologetic letter, offering to correct it in a future report; but nothing was done for years. In the meantime, Mr. Lubbock published his "Prehistoric Times" (1865), reproducing, *verbatim et literatim*, his erroneous chapter upon the mound pipes. I again called Prof. Henry's attention to it, which only resulted in the insertion of a short extract from my letter in his personal report (1866, p. 48). This must have escaped Sir John's notice, as the second edition of his work appeared without the least correction, and I presume it has been continued throughout the five editions of his work and its translations into five different languages of Europe. I know that the London Anthropological Transactions, and I presume other works, have copied this silly mistake; all of which, you can readily see, has done great injustice to the skill of the Mound-builders as sculptors in stone without the use of steel. . . .

With many wishes for the success of your pamphlet, I remain, most respectfully,

Your obedient servant,

EDWARD HAMILTON DAVIS.

From MARQUIS DE NADAILLAC, Author of "Prehistoric America," etc.

[In the recent edition of Nadaillac's "Prehistoric America," the editor, Mr. William H. Dall, has taken many liberties with the text, and thus has connected the name of this noted anthropologist with some peculiar theories in conflict with his well-known views. If the reader of that valuable work finds himself in doubt as to the extent of these unauthorized alterations of the text, he will do well to note the following emphatic disclaimer of this distinguished savant:]

8 RUE D'ANJOU, PARIS, 25 April, 1885.

CHAS. E. PUTNAM, ESQ., *President Academy of Sciences, Davenport, Iowa,*—

Dear Sir: I hasten to acknowledge the paper you did me the honor to forward me, on the elephant pipes of your Academy of Natural Sciences, and I may add that I have read it with the greatest pleasure.

I am of your opinion, that there can be no doubt that man lived both in North and South America in the quaternary period, and that he lived with the mastodons and other great mammalia of those days. I have never heard an objection of any great weight against it, and the mass of evidence, even as you surmise it, not all completely proved, is undoubtedly in its favor.

My book on "Prehistoric America" has been adapted, without my sanction or knowledge, by Mr. Dall, and my views on certain points have often been altered. I have always entertained very great doubts on the ascendancy of the actual red men. The Mound-builders were certainly more advanced in civilization, and, till yet, nothing shows how their actual degradation and nomadic habits came on the Indians, if they really descended from the first.

In case your Academy elects corresponding members, I shall be happy to be one of them, and to forward you all the papers I may publish. Believe me, dear sir,

Yours very faithfully,

NADAILLAC.

From DR. D. G. BRINTON, Professor of Archaeology and Ethnology, Academy of Natural Sciences, Philadelphia; Author of "Myths of the New World," etc.

PHILADELPHIA, PA., April 4, 1885.

CHAS. E. PUTNAM, ESQ.,—

Dear Sir: Accept my thanks for a copy of your rejoinder to Mr. Henshaw's criticisms. From my first reading of his article I considered it a paper not composed in the true spirit of science, and out of place in the publications of the Bureau.

Very respectfully yours,

D. G. BRINTON.

PHILADELPHIA, June 19, 1885.

MR. C. E. PUTNAM,—

Dear Sir: I have no objection to your making use of my letter. Of course, I do not pretend to offer an opinion on the authenticity of the objects in question—the readiness to do so in others, without personal examination and investigation, being precisely what I condemn in the article published by the Bureau.

Yours truly,

D. G. BRINTON.

From PROF. ALEXANDER WINCHELL, Professor of Geology and Botany, University of Michigan; Author of "Preadamites," "Sketches of Creation," etc.

ANN ARBOR, MICH., April 8, 1885.

MR. CHARLES E. PUTNAM, *President Davenport Academy of Natural Sciences.*—

My Dear Sir: I have received your "Vindication of Elephant Pipes and Inscribed Tablets." I am very glad to get it, for I was not aware that you could make so strong a case, so complete and entire a vindication. I fear there has been some hasty dogmatizing at Washington. It looks as if the authorities had been too willing to impugn the honesty or the sagacity of your Society.

As to the subject-matter of the controversy on Mound-builders, I am

inclined to go against the new doctrine lately started up, that they were the common race of hunting Indians. This view I maintained in my "Preadamites," a work with which you do not seem to be acquainted. The *crania*, of which the defenders of the new view have nothing to say, are irreconcilably distinct from those of the hunting Indians.

Very sincerely yours,

ALEXANDER WINCHELL.

From MR. S. A. MILLER, Author of "American Palæozoic Fossils," etc.

CINCINNATI, OHIO, March 31, 1885.

MR. CHARLES E. PUTNAM,—

Dear Sir: I have the honor to acknowledge receipt of your "Elephant Pipes in the Museum of the Academy of Natural Sciences," and am pleased to say, after having glanced over the pages, that your criticism of Messrs. Henshaw and Powell meets my approval. They had no warrant for their attack, and you are justified throughout in exposing them; and you might have gone further in accumulating the evidence of ignorance that glistens upon too many pages of the ponderous volumes issued by the would-be dictators of scientific learning under patronage of the Government. Through the instrumentality of a pseudo "National Academy," very poor timber has largely been selected for Government work.

All of the geological and palæontological evidence we have bearing upon the subject says man, mammoth, and mastodon were contemporaneous on this continent. Beginning with the literature on the subject — say from Caleb Atwater, in the *American Journal of Science and Arts*, in 1820 — and coming down to the present time, the facts accumulated all point one way, and are as convincing to the mind of any one capable of appreciating a geological and palæontological conclusion as any other series of facts establishing a truth in science.

I think you will find some of these facts thrown together by me in Vol. IV. of the Journal of the Cincinnati Society of Natural History, pp. 183-234, which is in the library of your Academy. But I was not writing for the purpose of proving that man and mastodon were contemporaneous, for I did not suppose that any one willing to read my article had any doubt on the subject, though I believe I incidentally referred them to the most recent, or post-pliocene, age.

The quality of the workmanship on pipes and tablets may go far to test the genuineness, in the light of the vast accumulations now in the hands of archæologists, but the statement that "the only evidence of the coëxistence of the Mound-builder and the mastodon" rests on the authenticity of these pipes, could only emanate from the ignorance which controls the Bureau of Ethnology. I do not mean to underestimate the value of the pipes as evidence, for if there was any doubt they would be conclusive, except to the mind of a Henshaw or a Powell. Thanking you for the article, I am,

Very truly yours,

S. A. MILLER.

From MR. B. PICKMAN MANN, *Editor of "Psyche."*

WASHINGTON, D. C., March 30, 1885.

MR. C. E. PUTNAM, *Davenport, Iowa,*—

Dear Sir: I have this day received and read with care your pamphlet on "Elephant Pipes in the Museum of the Academy of Natural Sciences, Davenport, Iowa." I commend the judicious tone of the criticism, and give full credence to your version of the discoveries, relying upon the intrinsic force of the argument and my faith in your character and that of your associates.

Respectfully,

B. PICKMAN MANN.

From REV. J. P. MACLEAN, *Author of "Mastodon, Mammoth, and Man," "The Mound-Builders," etc.*

[This distinguished archæologist, a few weeks since, visited our city, and delivered a lecture upon "The Mound-builders" for the benefit of the Academy. In concluding his lecture, Prof. MacLean made reference to the fact that an obscure individual by the name of Henshaw, who is in the employ of the Bureau of Ethnology, at Washington, had recently published a paper questioning the genuineness of the elephant pipes in the museum of the Davenport Academy, and making a gross and unjustifiable attack upon the good faith of the Academy and the integrity of its members. He stated that this man Henshaw was no archæologist, that his opinions had no scientific value, and that he himself had made a careful examination of the pipes, was familiar with their history, and that, in his opinion, they were undoubtedly authentic, and must be accepted as genuine mound relics.]

HAMILTON, OHIO, June 15, 1885.

CHARLES E. PUTNAM, ESQ.,—

Dear Sir: I have very carefully read your "Vindication of the Elephant Pipes." You have faithfully and thoroughly performed the work. I think no reasonable man will fail to be convinced. Personally, I never doubted the genuineness of these interesting and important relics. The first intimation that I ever had that their authenticity was questioned came in the article from Mr. Henshaw in the "Second Report of the Bureau of Ethnology."

I had supposed that the names of all American archæologists and ethnologists were familiar to me, but the name of *Henshaw* is entirely new. In fact, Major Powell was forced to explain to his readers that this man was a "skilled ornithologist." It matters not who he is, still his article is no credit to either himself or the Bureau that employs him. I think the American ethnologists are to be congratulated that not one of their number could be engaged to perform such odious work. The covert assault on Mr. Gass is unmanly, and one in which no true scientific man would engage.

It seems to me that the Bureau of Ethnology has overstepped its legitimate boundary in the publication of Henshaw's article. If it must engage in "criticisms" on finds which have been made, then let the criticism be open and manly, and from writers who have made some reputation in archæological research.

To some your strictures may seem severe, but, after considering the matter carefully, I think you have been no more than just under the circumstances. You certainly have literally annihilated Henshaw, and it is to be hoped that he will at once retire into that obscurity from which Major Powell has dragged him forth, and that his like may never again be seen in the land.

Yours respectfully,

J. P. MACLEAN.

From REV. HORACE EDWIN HAYDEN.

WILKESBARRE, PA., April 14, 1885.

C. E. PUTNAM, ESQ., *President Academy of Natural Sciences, Davenport, Iowa,*—

Dear Sir: Please accept my thanks for your very exhaustive and thoroughly satisfactory paper on the elephant pipes. It is an outrage that a man who has left his "last" should be allowed by pure insinuation to cast doubts on treasures as well authenticated as those of your society. The Smithsonian Institution is growing to be centralizing and jealous of other societies working in the same line. As Mr. Peet says, "I should consider Mr. Henshaw's statements a 'libel.'" Our Wyoming Historical and Geological Society will be glad to have your monograph.

Yours, with esteem,

HORACE EDWIN HAYDEN.

From W. E. BARNES, *Editor of the "Age of Steel."*

ST. LOUIS, MO., April 4, 1885.

CHAS. E. PUTNAM, ESQ., *Academy of Natural Sciences, Davenport, Iowa,*—

Dear Sir: I wish to express to you my great satisfaction at the manner in which you have answered Mr. Henshaw, of the Bureau of Ethnology. It seems to me that your vindication is complete. I was greatly surprised, in reading the Second Annual Report of the Bureau of Ethnology, to find so remarkable a statement emanating from this source, in view of the ease with which the Bureau could have communicated with your Academy and ascertained the exact facts in the case. The publication was not only unscientific, but almost a crime. I have been deeply interested in all your publications, and look forward with interest to the publication of your Vol. IV. I shall take occasion to refer to your pamphlet in the next issue of the *Age of Steel*. With kindest regards,

Yours very truly,

W. E. BARNES.

From ALBERT G. WEBBER, ESQ.

DECATUR, ILL., July 7, 1885.

CHARLES E. PUTNAM, ESQ., *President Academy of Natural Sciences, Davenport, Iowa,*—

Dear Sir: As requested, a copy of your "Vindication" was duly received, for which I tender you my sincere thanks. Your ably-written paper has the effect of a thunderbolt upon the stagnant insinuations of Mr. Henshaw. It purifies the cause of ethnology. Men at the heads of our national bureaus of learning must be taught that fellow-workers upon the field of discovery are entitled to a respectable recognition at their hands.

The cause of science has no official expounders. He who states facts which reveal the truth of nature has the paramount right to be heard, no matter who he is or where he may be.

May the Davenport Academy be instrumental in advancing the noble work in which they are engaged, and always stand up boldly, as in this instance, for its honor and the truth.

Respectfully yours,

A. G. WEBBER.

From E. P. VINING, Author of "An Inglorious Columbus."

CHICAGO, ILL., June 24, 1885.

CHAS. E. PUTNAM, ESQ., *President Academy of Natural Sciences, Davenport, Iowa,*—

Dear Sir: Permit me to express my sympathy with your reply to the attack upon your society contained in the last report of the Bureau of Ethnology of the Smithsonian Institution.

Original investigators — those who, amid many discouragements, are willing to spend time, labor, and money in endeavoring to learn something of the past history of this continent — are not numerous, and it is but reasonable to ask that no attacks should be made upon their honesty and good faith until after careful investigation and thorough examination have clearly shown them to be called for. When those who are supported in their researches by the Government attempt to criticise the work of the few volunteers who labor without hope of reward, even a special degree of care would seem to be due, and it is therefore surprising that the attack should have been based upon grounds which a mere glance at your pipes, or at the photographs of them, which were in the possession of the Smithsonian Institution, would have shown to be erroneous.

It is unfortunate that a very small doubt, based upon the shallowest or most mistaken of grounds, is often considered to outweigh the most earnest labor and the most convincing proofs. Nevertheless, time, which tries all things, will give to each his due.

Hoping that your society will not be discouraged in the prosecution of its good work, I remain,

Yours very truly,

E. P. VINING.

From PROF. J. HENRY COMSTOCK.

ITHACA, N. Y., April 5, 1885.

MR. CHARLES E. PUTNAM, *Davenport, Iowa,*—

My Dear Sir: Please accept my thanks for the copy of your paper on elephant pipes which was sent me. I have read it very carefully, and fully sympathize with your views as expressed in it.

Yours sincerely,

J. HENRY COMSTOCK.

From REV. W. M. BEAUCHAMP.

BALDWINVILLE, N. Y., April 7, 1885.

MR. C. E. PUTNAM,—

Dear Sir: I have read your paper on the elephant pipes with interest — all the more from having read Mr. Henshaw's article with like

interest. Frauds are so much more common with pipes than with other articles, that it is no wonder men are suspicious; and, at the same time, in the genuine work of a rude age resemblances are often so doubtful as to render caution necessary. In the many spirited bird and beast pipes I have figured, I should hardly wish to be pinned down to a naturalist's exactness in identifying specimens, although a naturalist myself. So far, I felt that Mr. Henshaw's paper was likely to guard against erroneous conclusions founded on doubtful premises. But it is wrong to expect that in such work there will be complete representation of anything, any more than when we work birds and beasts with designs of a useful nature, or employ them in heraldry. There is a stone pipe here which undoubtedly was made from a reminiscence of the domestic cock—perhaps by an Onandaga of two centuries since—but the only thing to make this certain is the cock's comb; that attracted the eye, and could be represented. The tail had to be left off, and the body was more that of a woodpecker than anything else. I do not, therefore, think the absence of tusks in your elephant pipes anything of moment. It would have been quite enough had the head and trunk been there. Neither, as a clergyman, could I suppose the Rev. Mr. Gass to have countenanced any imposition—nor the eminent society with which he is connected. But I have done archaeological work enough to know that some persons do not hesitate to try to impose on clergymen, and that people who know better are not above this. I have seen unblushing frauds in such unexpected quarters that I always like to have the bottom facts in any unusual find. The very best archaeologists in the country are often imposed upon, and, of course, to outsiders it seemed possible that you might have been deceived by unscrupulous persons. I am glad to find you have so full and complete an answer ready.

For a great many reasons, I have had no disposition to question the genuineness of the find. Among these is my firm persuasion that the mastodon, or even the American elephant, has not been long extinct. I see no reason, from geological facts and facts of natural history, to remove him from the earth before man appeared upon it, although he doubtless lived partially before man. . . . In a sense, I believe that the Indians and Mound-builders were of one race, but it is in the same way that we are one with the French and Germans. I have not the slightest idea that the Mound-builders were ancestors of our present Indians; I simply regard them as often having the same general origin. Our finds here show no recent connection.

. . . The many friends of your Academy to you unknown will be gratified to see your prompt action in this matter, for you have thus done a duty not only to yourselves and one of your active members, but to the scientific world at large at the same time. With thanks for your courtesy and best wishes for your continued prosperity, I remain

Yours truly,

W. M. BEAUCHAMP.

From PROF. GEORGE SHELDON.

DEERFIELD, MASS., April 8, 1885.

CHARLES E. PUTNAM, ESQ., *President Davenport Academy*,—

Dear Sir: I have this day received your pamphlet on elephant pipes, for which please accept my thanks. I have read with interest your clear statement in defense of Mr. Gass and your institution. My sympathies are entirely with you against the cruel insinuations of Henshaw. I have great respect for an honest scientific expert, and an equal contempt for those sweeping condemnations based on the necessity of maintaining a theory. I am in full accord with you in the remarks on local societies. It is here that the principal work must be done; here is the place for the great lights of science to come for facts and material for their theories. The encouragement of such institutions should be a prime object with the Smithsonian. The great universities of the land are excellent things, but in no view can we dispense with village schools. No complete and satisfactory examination of an unusual find can be had except on the spot, and as near the time as may be. . . . I can as yet find no satisfactory solution to the query, "Who were the Mound-builders?"

Very respectfully yours,

GEORGE SHELDON.

From CHARLES H. STUBBS, M.D.

WAKEFIELD, PA., April 30, 1885.

Secretary of Davenport Academy of Natural Sciences,—

MY DEAR SIR: The copy sent me of the paper by Mr. Charles E. Putnam, on "Elephant Pipes in the Museum of the Davenport Academy," was received only a few days ago. You will please accept my thanks for the same. I have read it carefully through from the beginning, and unhesitatingly say that the arguments therein presented are such as to convince any unbiased thinker as to the correctness of the points taken and the positions assumed. Mr. Henshaw, the scientific ornithologist of the Bureau of Ethnology of the Smithsonian Institution, is, as suggested, a new light recently appearing in the archæological firmament, and of little moment as ethnological authority. Why he should doubt such endorsement as your honored Academy is passing strange. Jeune writers are prone to be hypercritical, and he seems to be no exception to the general rule.

In conclusion will say that I delight to read anything bearing upon the origin of the race of Mound-builders, their habits and customs. The problem, from whence they came and who they were, seems to me as yet unsettled. Who knows but that it may yet be decided by the Davenport Academy of Sciences, or some other kindred association that relies upon the enthusiasm of its members, and not upon those who are fed upon Government pay, and able to pay parties to roam over and dig up relics in various sections of the country?

Your friend and well-wisher,

CHARLES H. STUBBS, M.D.

From DR. E. STERLING.

[We should be glad to publish Dr. Sterling's valuable letter in full, but its extreme length, and our limited space, will permit us to include only some brief extracts. The publication of this correspondence has made such unexpected demands upon our space that we shall be compelled to adopt the same course with the remaining communications. We are indebted to the courtesy of Dr. Sterling for several excellent pamphlets, by Col. Charles Whittlesey, having an important bearing upon the questions under discussion.]

CLEVELAND, OHIO, April 9, 1885.

At this late day, to mention our Indian as a descendant of the extinct "Mound-builder" is hardly worth the passing thought of any one who has carefully made this matter an honest study. As for the elephant and mastodon, there is proof enough, to any man who has eyes that will see, that both these animals lived down to a comparatively recent time, when our Indian hunted them for food with as good success as the African does in his native jungle to-day.

Some fifteen years ago a large ditch was dug through a cranberry swamp in Lucas County, in this State, at a point where the muck of the bog was about eight feet deep on the layer of "hard-pan." The bones of a mastodon were found, most of them in a state that would not bear preservation. Those of the fore and hind legs were in a sound state, in an upright position, showing that the animal bogged in seeming solid muck, as in thin mire he would have wallowed, and in struggles these bones would not have been found in the position mentioned, proving that he was not mired in the early days of the bog.

Three miles from the city may be seen the remains of a bog which could never have extended over two acres of ground, in the widest place sixty feet, and depth seven feet. To-day it is reduced to one-half an acre. Through it runs a little spring-fed brook, never more than six feet wide. A stepping-stone used for crossing it was cut one day by the hatchet of an investigating boy. The chips seemed curious, and, on examination by others, proved to be ivory. Short work with a spade unearthed a well-preserved tusk of the *Elephas Primigenus*, and further work the next day resulted in the finding of two vertebrae, three ribs, a molar, portion of sacrum, and other bones of less consequence. When our society has the funds, further researches will be made, when it is expected to find most, if not all, the remaining bones.

This bog is on the gravel bluff on which Cleveland is built, two miles from Lake Erie, and down grade all the way. From many indications, Col. Whittlesey and other competent judges are positive that this bog is quite recent—less than five hundred years old. The bones, too, would indicate recent deposit, as they contained a marked amount of animal matter, and were better preserved than any I have ever met with. It will take much proof, and stronger evidence than I know of, to make me believe those elephants were mired in those bogs before the Indians roamed these forests, or before the Mound-builders possessed the State and constructed their wonderful works.

From C. A. HIRSCHFELDER, ESQ., U. S. Consul.

TORONTO, CANADA, April 15, 1885.

The steps taken to vindicate certain unjust accusations made

against specimens belonging to your museum meet with my most hearty approval and sympathy. The assertions, in my opinion, were unjust, uncalled-for, and unscientific; they were such as to cast stigma upon all students who carry on field work. As one who has carried on field work in archaeology for over ten years, I feel most sensitive over the remarks made, because it insinuates—in fact, directly states—that specimens found by outsiders which are different from any in the Smithsonian Institution are not to have any faith as to their genuineness placed in them. Now, I have found many unique relics, and it is rather hard on me if they are to be looked upon with suspicion because I myself am the only one who can assert positively that they are genuine; and yet, according to the article, my word is to go for nothing. We should expect, from an institution like the Smithsonian, that science would be encouraged, but they have taken rather strange steps in this direction. There is, however, one satisfaction, and that is the proof which the pamphlet plainly gives of the genuineness of the elephant pipes, showing, as it does, Mr. Henshaw's absolute ignorance of the subject on which he was writing.

I thank you for sending me your pamphlet, and trust that it may have the effect of in future making critics a little more cautious, and not attempt to insinuate against the genuineness of relics without good foundation for doing so.

From A. E. BLAIR, ESQ.

CASTLE CREEK, N. Y., September 30, 1885.

Mr. Henshaw's position reminded me of some students who, when they have mastered the alphabet of a new language, feel as if they understood the whole thing. His attack upon the Academy was, to say the least, unprovoked and ungentlemanly. Surely, if no "find" or discovery were to be accredited except when made under the eyes of an inspector, some of our most valuable relics must be laid aside as unreliable. It is extremely unfortunate that the Smithsonian Institution should stamp its approval upon an article so full of errors as Mr. Henshaw's paper was, since to many of its readers only that one side will be presented.

From W. A. CHAPMAN, ESQ., Assayer.

OKOLONA, ARK., September 6, 1885.

I am much pleased with the course pursued by the Academy in this controversy, and regard the authenticity of the pipes and tablets as settled beyond dispute. My pleasure can be better defined when I state that I have been an independent investigator, doing much of the labor with my own hands, and often laboring alone. Had I been so unfortunate as to have made the invaluable discoveries of Mr. Gass, I should have been obliged to face the Smithsonian batteries without his able defenders, and must have suffered complete annihilation. The defense of Mr. Gass is the defense of all private investigators.

From GRANVILLE T. PIERCE, ESQ.

SOUTH BRITAIN, CONN., July 15, 1885.

I have the pleasure of acknowledging the receipt of your paper relating to elephant pipes, for which I beg you to accept my thanks. I read the pamphlet with much satisfaction, mingled, however, with a rising indignation at the thought that men of science could be so unfair. I am decidedly of the opinion that you have the best of the argument, nor do I discover anything contrary to truth and reason in the facts as you have stated them.

From J. THORBURN, ESQ., of the Geological Survey.

OTTAWA, CANADA, April 24, 1885.

I have to acknowledge, with many thanks, the receipt of a copy of your pamphlet on "Elephant Pipes in the Museum of the Academy of Natural Sciences." I have read it with great interest, and, notwithstanding what has been said and written on the other side of the question, I consider you have fully vindicated your position. Unhappily, so many hoaxes have been perpetrated upon the public that one is naturally inclined to receive discoveries of the kind referred to by you with some degree of caution. The whole question is a most interesting one. Have you seen any of the work of the Haida Indians of British Columbia? They show a marked degree of artistic skill. We have a considerable number of them in our museum. Even their commonest utensils are highly ornamented.

From CHARLES N. LAUMAN, ESQ.

CHICAGO, ILL., April 27, 1885.

I received your pamphlet and read the article with much pleasure. It was clear and forcible, and, except that the members of the Academy are subjected to imputations on their good faith which, while baseless, cannot but wound generous characters, the Academy is to be congratulated on an attack which has afforded opportunity for such complete vindication.

From S. H. BINKLEY, ESQ.

ALEXANDRIA, OHIO, April 15, 1885.

Your admirable "Vindication" was received. In looking it over, I was surprised—nay, amazed—at the reckless indifference exhibited by Mr. Henshaw in his ruthless and baseless criticisms. Nor is Major Powell exempt from censure in permitting this mass of cruel insinuations to go forth as the dictum of the "Great Sanhedrim," from which there is no appeal. You have well said, "the mischief is done." Foreign scientists have "let in" a whim that the wisdom of the nation is concentrated at Washington, and (I am sorry to record it) this gross absurdity is covertly fostered by those from whom we expected better things. If my memory is not defective, the Davenport tablets were accepted by the French *savants* as authentic. . . . Although in

the estimation of all intelligent readers of your very able vindication, outside of that formidable "Bureau," there will be unanimous approval, yet I am apprehensive that Mr. Henshaw will be found safely intrenched behind the wing of the "Bureau," calmly contemplating your sharply serrated arrows falling harmlessly at his feet; but the time will come when your position will be fully sustained.

From PROF. ERASMUS HAWORTH, *Penn College.*

OSKALOOSA, IOWA, April 4, 1885.

Your pamphlet on "Elephant Pipes" came to me to-day. I have carefully read it, and the least I can say of it is that it is very interesting. All of us who are at all interested in science are indirectly interested in it. If facts which are as well established as the authenticity of the pipes and tablets are thus to be assailed by those who should be high authority, what may we not expect in other departments? I fear this portends an unhappy condition in scientific circles.

From A. DEAN, ESQ.

HIGH BRIDGE, N. J., April 24, 1885.

I have lately received your "Vindication" of the Davenport Academy of Natural Sciences against the accusations of the Bureau of Ethnology, and thank you sincerely for your courtesy and kindness to one who must be to you a stranger. I have read your paper carefully and am delighted with it. Mr. Henshaw's attack seems to me to be uncalled for, cowardly, baseless, unscientific, ungentlemanly. I find it impossible to account for the seeming complicity of the Smithsonian in the assault. Prof. Henry was eminently candid and courteous, and until now I had supposed Prof. Baird was too large a man to be jealous of a society like that at Davenport. I am glad you have repelled the charges so meanly insinuated without a scintilla of proof, and that you have made the rejoinder so unanswerable. . . . I have long honored the Davenport society for its industry, and I trust it will not falter in its work because of Messrs. Henshaw and Powell.

From REV. D. W. C. DURGIN.

PIKE, N. Y., April 27, 1885.

Through your kindness I have received, and with interest read, your "Vindication of the Authenticity of the Elephant Pipes." I had previously read Mr. Henshaw's views of the elephant pipes, and speaking, as I supposed, "as one having authority," I was inclined to accept his verdict as final, and to look upon the "relics" in question as a transparent fraud. It did not seem to me that the spokesman of a great national institution would treat with such seeming contempt any "find" that had the least presumption in favor of its genuineness. Your "Vindication" presents the matter in a different light, and furnishes to my mind strong probabilities that the pipes are genuine.

From J. A. LINTNER, ESQ., State Entomologist, New York.

ALBANY, N. Y., April 8, 1885.

Please convey to your society my thanks for the excellent publication of Mr. Putnam upon "Elephant Pipes." It seems to be, from a part reading, an admirable refutation of the unworthy attack made upon the collections and operations of your society. I regret very much that anything of the kind should emanate from Washington, but it is obvious that a great effort toward "centralization" is being there made.

From B. F. WALLER, ESQ.

NEW PALESTINE, MO., April 13, 1885.

Through the kindness of Mr. O. W. Collet, of St. Louis, I received your pamphlet vindicating your society from the imputations of fraud, so ungenerously accused by the Bureau of Ethnology. I regard your defense as being an able one, and of sufficient weight to carry conviction to all honest seekers after scientific truth. I have been led to suppose that your collection contained many spurious relics, but since reading your pamphlet I am now convinced otherwise.

From OLIVER D. SCHOOK, ESQ.

HAMBURG, PA., April 10, 1885.

Your pamphlet relating to "Elephant Pipes" is received. In writing this to you in thankful acknowledgment, I can only express my regret that any occasion should have arisen that would have required this vindication, which I think is complete.

From EDWARD L. BERTHOUD, ESQ.

GOLDEN, COL., April 25, 1885.

I have received the "Vindication," and have read it with profit, pleasure, and satisfaction. I thank you for the work, and am very much pleased at the stand you have taken in the Davenport Academy. . . . I know something of Mr. Henshaw, and I think he has "brass" enough in him in thus settling, *ex cathedra*, what has puzzled and foiled the repeated attempts of some of the best antiquarians in America for over half a century. I see nothing improbable in the mastodon being an animal cotemporaneous with the early inhabitants of the Ohio and Mississippi valleys, and I firmly believe it was living there since human occupation.

From MR. R. P. GREG., F.R.S.

COLES, ENGLAND, April 29, 1885.

I have just received your paper on "Elephant Pipes from one of the Mounds in Iowa," for which I am much obliged. I am much interested in prehistoric America, but as yet have not come to any fixed opinion as to the origin of the Mound-builders, or their connections with the old Mexicans. I may observe, however, with re-

spect to representations of elephants, that they have been not infrequently found deposited in the ruined cities of Central America, and they seem to have an Asiatic-Indian appearance.

From MAX UHLE, *President of the Royal Ethnological Museum.*

DRESDEN, PRUSSIA, May 7, 1885.

I have read with great interest the pamphlet you were so kind to send me, on the elephant pipes which are preserved in your important museum at Davenport. On reading your treatise, and inspecting the wood-cut of one of the pipes accompanying it, I have become inclined to believe in the genuineness of the pipes in question. In no case should objections based upon circumstances of the finding, if not accompanied by objections taken from the marks of the things themselves, suffice for the decision in such a matter, and it is to be wondered at that so eager attacks are undertaken as to the authenticity of relics without any inspection of the things themselves.

From DR. JOSEPH BELLUNI.

(TRANSLATION.)

PERUGIA, ITALY, April 30, 1885.

I am in receipt of your defense of the authenticity of the elephant pipes in the museum of the Academy of Natural Sciences at Davenport. I thank you sincerely for sending me this paper, which I endorse fully, and which I have read with great pleasure and instruction, at the same time admiring your learned and exhaustive criticism of the counter-argument.

From EDGAR HEPP, *President of the Society of Science, Morals, Letters, and Art.*

(TRANSLATION.)

VERSAILLES, FRANCE, May 19, 1885.

I have the honor, in the name of the Society of Science, Morals, Letters, and Arts of Seine and Oise, to thank you for the obligation under which you have placed it for your monograph on "Elephant Pipes." One of the members of our Society, the learned Dr. Osnard, presented to us in the session of May 8th a complete report of the interesting discoveries which signalize your work, and which renew interest in the studies of Marquis De Nadaillac upon American antiquities. One of the members of our Society made the remark that the use of the pipes, so general among Americans when they assemble themselves, serves to preserve their national traditions among all the village Indians, where the calumet is still held in honor.

Whatsoever may be the worth of this consideration, your communication has in a lively manner interested the Society, which expresses but one regret, which is that knowledge of the English language is a privilege enjoyed by only a small number of the members, and that our Society is therefore only able at this time to associate itself in an unsatisfactory manner with the spirit of scientific investigation in your Academy.

From OSCAR W. COLLET, Esq.

[The Davenport Academy was indebted to the thoughtful courtesy of Mr. Collet for the first information received of the accusations made by Mr. Henshaw against the authenticity of its relics and the integrity of its members, and it was largely due to the emphatic opinions expressed by this eminent scholar as to the damaging effects of these charges that induced prompt action on the part of the Academy to repel this unjustifiable attack. As will be seen, Mr. Collet does not approve the methods adopted for this purpose, and considers that, inasmuch as we did not follow his kindly counsel, therefore the publication of his original letter would only do us injury. As indicating, however, the unscientific methods adopted by Mr. Henshaw, as well as the disastrous effects of his accusations if allowed to pass uncontradicted, these views of a profound and disinterested investigator possess great scientific value; and hence we cheerfully avail ourselves of an implied assent, and now place these important communications before the scientific public.]

ST. LOUIS, MO., October 8, 1885.

Dear Sir: I have been ill for a long while, and am scarcely restored to health as yet. I received a letter from Mr. Putnam, but do not know whether I answered it, or was able to answer it, when it came to hand.

What I wrote at first expressed my sentiments; they remain the same. But what I reprobated was the attack itself, and its manner. I do not go into the scientific value of the finds. I believed, and still believe, the parties at Davenport were strictly honest—not scoundrels, as represented by the Ethnographical Bureau—and that what they gave to the world were facts. As to whether they have themselves been deceived, the importance of the finds, Mound-builders theories, contemporariness of man and the hairy elephant in Iowa, and all such matters, they are entirely beyond the question, for they are points for legitimate criticism, whereas personal honesty is not. What excited my indignation was not that supposed errors were pointed out, supposed mistakes criticised, the scientific value of finds attacked, but that the personal honesty, integrity, and truthfulness of men should have been wantonly assailed, their characters vilified, and, outside the special objects under consideration, their entire work deteriorated and damaged with a recklessness unjustifiable and uncalled-for. In this I speak only as an ordinary educated gentleman, and, as such, competent to form an opinion in the premises. Farther than this I do not go, as I do not feel that I possess sufficient knowledge to enter into a discussion of archaeological questions with those who have made such matters a special study.

Therefore, as the answer you have deemed it advisable to publish has gone beyond the occasion, and taken up the discussion of debatable questions, the use of my name, so far from helping your cause, would damage it.

Yours truly,

OSCAR W. COLLET.

PROF. PRATT, *Davenport, Iowa.*

ST. LOUIS, MO., July 6, 1884.

* PROF. W. H. PRATT, *Davenport, Iowa,*—

Dear Mr. Pratt: In the 1880-81 Annual Report of the Bureau of Ethnology of the Smithsonian Institution, in a paper by Mr. Henshaw, there is an attack upon the Davenport Academy of Sciences and Mr. Gass, which not only affects them as scientists, but their personal honesty and integrity of character. The question is not simply one of

opinion, of judgment, or of error, but they are charged by very direct implication with being perpetrators of frauds. The most favorable view that can be taken is that they are either great simpletons or accomplished knaves. If the parties thus arraigned before the world for so grave an offense keep quiet, and suffer the imputation of dishonesty to remain, their honor and reputation is forever overclouded, an irreparable damage done their entire work, the whole collection placed under the ban of permanent suspicion and doubt, and its value diminished to the very lowest point.

Under these circumstances no mere protest, however strong, will meet the case or remove the stain. I presume, from what I have read and heard, that it can be established that the finds called in question and alluded to are genuine finds; and established judicially, and that none of the parties thus so seriously implicated have been guilty of any knavery in the premises, and that none of them, to this day, have any reason to believe they have been made the victims of deceitful proceedings of any kind. If one and all, as I take to be the case, they are conscious of their own integrity and freedom from guile in any and every matter touching these finds, I do not well see how they can avoid instituting a libel suit and bringing out the evidence, and thus vindicating their own integrity, a matter of more importance than any archaeological questions.

I think, moreover, you owe this to others as well as yourselves. There are many who, without passing opinion on the finds in question, from the best helps they could get, have insisted strongly that whatever might be the value of the specimens to archaeology, the persons themselves were honest, and that their acts could be depended upon. I do not see what other course is open, for the writer, not satisfied with his most damaging imputations, goes on to poison the wells, to forestall any vindication through the discovery of other objects; for, on page 157, he goes on to say that each succeeding carving of the mastodon, be it more or less accurate, instead of being accepted as cumulative evidence, will be received with ever-increasing suspicion. Monstrous!

I write very plainly, because I feel that the gentleman in question has gone outside the record to attack the reputation of others in a manner which nothing but the most sure evidence in his possession of their fraudulent acts could for an instant justify.

I beg to be remembered to your associates whose acquaintance I casually formed, and to Mrs. Putnam in particular.

Very truly yours,

OSCAR W. COLLET.

From DR. J. B. HOLDER, *of the American Museum of Natural History, Central Park, New York City.*

[We have been favored by Dr. Holder with the perusal, in advance of its publication, of a valuable paper upon "Some Aesthetic Features of Prehistoric Art," and now avail ourselves of his kind permission to include herein its opening paragraph.]

American archaeological science seems to be, in a sense, homeless, notwithstanding it is large and growing. There are, to be sure, excellent institutions holding with jealous care objects of great worth. The

American Antiquarian Society, at Worcester, beginning the category with the oldest in point of time; the Smithsonian Institution; the Peabody Museum of American Ethnology, in Cambridge; the American Museum of Natural History, Central Park; and the well-known Davenport Academy of Sciences — all prominent, with great devotion to this branch of science.

Though these institutions are presided over by able scholars, yet there is certainly a great lack of uniformity of methods. Also, there seems to be desirable a purer spirit of science exercised in the disposition of material, and a more wholesome comity of intercourse between individuals and institutions devoted to this subject.

Though our notes more largely appertain to other features, yet we are constrained to regret the attitude of some archaeologists towards the proceedings of the Davenport Academy. The reputation of this institution is too well established to be lightly arraigned, even if it be a monotreme, or a toothed bird, or a loxolophodon that its council offers for consideration in the shape of a carved stone pipe. By all the amenities are we not bound to give respectful attention? As Falstaff says:

“But, then, think what a man is.”

Are not the members of the Davenport Academy gentlemen and scholars? Should not the title of their published transactions be an unquestioned guaranty of high motives, the contents always, of course, subject to clear scrutiny and fair revision, as in all other like instances?

DR. WILLIS DE HASS, *Washington, D. C.*

[In a communication bearing date March 31, 1885, Dr. De Hass thus refers to the attack of Mr. Henshaw upon the Davenport Academy and its published ‘Vindication’: “I will here say that the unjust criticism of which you complain can do no injury to the tablets and pipes. Criticism, to have weight, must be made by competent authority. The persons of whom you complain are not archaeologists, and their opinions on such subjects are not regarded as possessing weight by competent archaeologists.” During the past winter Dr. De Hass favored the Academy with a lecture upon “Prehistoric Archaeology — Progress of Discovery,” in which he referred at some length to the relics in question. Coming from so competent and distinguished an archaeologist, his investigations and conclusions must carry with them great weight, and hence we have extracted this portion of his lecture.]

Having said thus much in commendation of the Academy and its excellent work, it may be expected that I shall say something of the charges so industriously circulated, affecting the value of certain discoveries. I can add but little to the masterly “Vindication” made by President Putnam. His admirable rejoinder is full, thorough, lucid, and convincing. The charges and insinuations made by captious critics are unjust and unfounded. I have carefully examined the relics specially objected to, and have no hesitation in pronouncing them equally entitled to credit given to the collection generally. The elephant pipes, which have elicited so much criticism, I consider as genuine as the most undoubted specimens in the museum. Subjected to the sharpest tests, they pass successfully. The principal objection to the pipes is that they are anomalous — that no similar forms occur in other collections, and that the mastodon did not exist contemporaneously with man. I could present abundant evidence in contradiction

of the assumption, had I time. At the Montreal meeting of the American Association for the Advancement of Science I read a paper on the "Antiquity of Man in North America," in which a strong array of facts was presented in support of the contemporaneous presence of man and mastodon on the continent. I need not, however, detain you, as these facts have been well stated by Mr. Putnam — suffice it, the evidence is clear and conclusive to any unprejudiced person. It may be important, perhaps, to state here that the Grant County (Wisconsin) "Elephant Mound," which has been questioned, actually exists, and can be seen by any visitor. Anxious to get all the facts bearing on this disputed point, I addressed a letter to the County Surveyor of Grant County, and here is his answer:

PATCH GRASS, GRANT COUNTY, WIS., July 29, 1885.

DR. W. DE HASS, *Chicago, Ill.*,—

Dear Sir: Your favor of the 23d inst., inquiring about the elephant mound, at hand. Some time between 1871 and 1875, at the request of Mr. Jared Warner, I made a measurement of the mound, also a rough sketch. The measurement and sketch Mr. Warner sent to the Smithsonian Institution. It has since appeared in one of the reports of that institution. The mound is located on the Mississippi River bottom; soil is sandy, with fine gravel. Head to the south, back to the west. My recollection of the measurement is, 66 feet from back to feet, 132 feet from head to tail, and about 7 feet elevation along middle of side. At the time I made the measurement the ground had been cultivated three or four years, consequently the tail and trunk, which were formerly quite distinct, were rather obscure. At present the mound is rather indistinct, the ground being cultivated every year since it was first broken. In the immediate vicinity there are quite a number of other mounds.

Very respectfully yours,

J. C. SCOTT, *Surveyor.*

But this is not the only "elephant mound" in Wisconsin. Since coming west my attention has been called to another work near the shore of Green Lake, Wisconsin, and I sent directions to the County Surveyor of Green Lake County to visit and measure the mound referred to. In reply to my note he wrote as follows: "There is an elephant mound on the old Danty farm, at the west end of Green Lake. It is one of a large number of mounds." I have not yet succeeded in getting an accurate description and measurement of this mound, but expect to do so very soon. I may further add that a correspondent in Minnesota communicated the fact that he had found another elephant mound near Red Wing; and in this connection I may refer to the announcement, made a day or two since, of the discovery, in this mound, of the remains of a mastodon.

Of the tablets, which are also distrusted, I may add that, soon after their discovery, the late Professor Foreman, of the Smithsonian, and myself made a careful investigation and study of them. We could not determine their real character, but we did not doubt their genuineness.

The point is made against these several discoveries that they are anomalous, therefore not genuine; that, in the case of the pipes, there is no evidence that man and the mastodon existed contemporaneously. I have shown how fallacious is this argument as referred to in my paper before the American Association at Montreal. In the case of

the tablets, the further objection, readily presented by all novices and quibblers, that the Mound-builders did not possess the means of recording data, or perpetuating ideas, is urged. Scores of sculptured stones, of unquestioned genuineness, have been rescued from mounds, or other ancient depositories. Rock-sculpture was extensively practiced by prehistoric nations.

In concluding, I may remark that it is always unfortunate when doubts and quibbles occur about scientific discoveries. All important discoveries in archaeology are liable to misconception, distrust, and malicious quibbles. This is one of the penalties incurred by all whose names are associated with important discoveries. The skepticism of man is as remarkable as his credulity. The discovery of the Rosetta Stone was questioned, but the Cardiff Giant was swallowed whole, even by scientists! Those who are interested in the success of the Academy must not lose courage or faith, but maintain the integrity of the institution and the objects which enrich it.

We must here conclude these selections. The letters and extracts given have been taken somewhat at random, but fairly represent the tone and spirit of the entire correspondence. To the larger number of those whose valuable communications have not been specially mentioned, it should be stated, in explanation, that it is only because of our limited space, and that in its defense against the ruthless assaults of the Bureau of Ethnology the Davenport Academy has been greatly encouraged by their very general and hearty expressions of approbation and support. It only remains to present to our readers the few communications received which are unfavorable to the positions we have assumed or the methods we have adopted in making our defense. As we have no pet theories to maintain, and only desire to ascertain and establish the truth, it affords us pleasure to thus give both sides a fair hearing.

From DR. J. F. SNYDER.

[The communication of Dr. Snyder is unique, in that it is the only one we have received that controverts the contemporariness of man and the mastodon, and therefore, by implication, leaves our ancient artist without a model for his carving of the elephant. At the same time, it furnishes to Mr. Henshaw a "model" of an argument, without an accusation of "fraud." Dr. Snyder has the courage of his convictions, and bravely confronts all the recent discoveries in archaeology with the now generally abandoned theory, that the elephant had disappeared from the American continent before the advent of man. It must be conceded he has constructed an ingenious argument, and, notwithstanding its extreme length, we are gratified to place it before our readers.]

VIRGINIA, ILL., March 22, 1885.

CHARLES E. PUTNAM, ESQ., *Davenport, Iowa*,—

Sir: If the chief object of your well-written pamphlet is to vindicate the veracity and honesty of purpose of Rev. Mr. Gass, I think you have succeeded well in your purpose. I can see no good reason

for doubting his integrity and truthfulness, and I accept his statements without question. I believe the elephant pipes and inscribed tablets were discovered exactly as represented in the published accounts of their finding by the Davenport Academy of Sciences; and I have no disposition, at present, to inquire into the possibility of fraud having been practiced by other designing persons. Mound-building, I know, was practiced by some of our Indians down to a comparatively recent date; and, in many instances, articles of modern manufacture have been found interred in the mounds, together with ancient stone implements, etc. Consequently, while I believe Rev. Mr. Gass to be innocent of practicing deception, I yet cannot give my assent to the inference that the pipes and tablets are the work of a pre-Columbian people; nor do I see any reason to ascribe to them a higher antiquity than the date of the advent of Europeans into this valley.

The elephant pipes are presented to the scientific world as new and valuable corroborative evidence of the coeval existence of man and the great proboscidiæ on this continent. If this high claim could be established by irrefragable proof of their prehistoric origin, their evidence would be startling indeed. Owing, perhaps, to inherent perverse dullness, or ignorance, I must frankly confess that I am yet skeptical as to the contemporaneous existence of man and the mammoth anywhere on earth. Obviously, in the brief limits of a letter, I cannot state much more than my convictions. To cite and discuss facts and authorities at length, and to elaborate the reasoning by which I have been compelled to reject the apparently well-founded conclusions of men far abler than myself, would require the space of a considerable volume.

Admitting the well-known fact that the bones of man and the products of his arts are often found intimately associated with the remains of the mammoth and other extinct animals, in the drift-gravels of England, of Nebraska, of the valley of the Somme, at Neanderthal, on the Pomme de Terre, and elsewhere, does it prove more than the operation of the process that may at this day be going on at the Mer de Glace and other great glaciers, where the bones of the perished hunter and his weapons and accoutrements, on the surface, may ultimately be rolled away and buried in the moraine, together with the remains of the mammoth long before entombed beneath the sea of ice? I think the agency of local glaciers fully explains many of the splendid discoveries of MM. Boucher de Perthes and Lartet, and others, in the valleys of Southern France. But we are told that we have the testimony of witnesses, written on tablets of ivory, who actually *saw* the great hairy mammoth stalking about on the eastern slopes of the Pyrenees and in the valleys of old Gascony. Among the relics of early man exhumed at Les Eyzies and La Madelaine were fragments of ivory, on some of which were rudely scratched the unmistakable outlines of the huge monster, with its curiously curved tusks and long, shaggy hair. Of these clumsy etchings of the great beast, Sir Charles Lyell says: "If the representation had been merely that of an elephant, we might have conjectured that some African tribe, migrating to the south of France, had

brought with them a drawing of the animal as it still survives in that country. But the characteristic wavy lines of the long hair of the mammoth allow no escape from the conclusion that the cave men saw this animal in life, and that they were sufficiently advanced to make a tolerably faithful sketch of it." If the sketch, or sketches, in question had represented the elephant, or mastodon, whose remains are found there, as well as in almost all parts of the world, the presumption of coeval existence of artist and animal would be well-nigh conclusive. But the sketches represent the *hairy* mammoth, that is not known to have ever lived within a thousand miles of that locality. So far as I have ever been able to learn, no remains of this identical species of pachyderm have ever been found in France; and no other fragments of ivory, or other representations of elephant or mammoth, have yet been discovered there, except in that one locality.

These "cave men," among whose remains those wonderful inscribed fragments of ivory were found, it must be borne in mind, belonged to the "reindeer period" of human civilization, and were, beyond doubt, exotics of far northern or north-eastern origin. They were essentially hunters, who had, for some reason, migrated from a distant region to the more genial valleys of France and Switzerland, and brought with them their arts and their reindeer herds. Though troglodytes, and perhaps cannibals, they had advanced, in no mean degree, in some of the arts, as is seen in their implements of stone and horn and in their neat carvings. Compared with their clear and expressive representations of the reindeer, fish, horse, etc., sculptured on horn, the pictures of the hairy mammoth on the ivory fragments are the merest scratches. These and other considerations have convinced me that those curious pieces of ivory, with the amazing records they bear, were brought by the reindeer men in their exodus from their former homes, and were the highly prized trophies of some daring party that had penetrated to the frigid north, and there *saw*, frozen in the ice, the carcass of the great animal they essayed to portray on bits of its own ivory, in order to bring to their tribe tangible proof of what they had seen; just as the Tungusian hunter who, at the beginning of this century, discovered, frozen in the ice of the Lena delta, the body of one of the same great hairy mammoths—now in part preserved at St. Petersburg—and cut off its tusks and carried them home to verify his marvelous find.

The late Col. J. W. Foster, I.L.D., stated that bones of the mastodon had been found, in the Mississippi Valley, so recently dead, and containing yet so great an amount of animal matter, that a nourishing soup could be made of them! What nonsense! With all the knowledge we have of the existence of the elephants on this continent, is there a geologist of reputation who will assert that we have *positive* proof that even a single individual of them survived the latest glacial, or drift, period? The very freshest of their remains would yield no more "soup" than would a chunk of granite or hematite.

With all the evidence of man's early occupancy of this continent before us, including the many instances of association of his remains and vestiges of his arts with the remains of gigantic extinct animals—

not overlooking the equivocal palæolithic stone implements of the New Jersey river-gravels, or the so-called elephant mound and elephant pipes — is there an archæologist who will contend that we have *positive* assurance of man's appearance on this continent *prior* to the latest drift period? I believe that anthropologists are agreed that the American Indian is an exotic, not an autochthon; but what period of time elapsed, after the recession of the great ice-fields, before he was introduced here, we have no means of knowing. Nor have we reliable data to serve as a basis for any satisfactory conjecture as to the mental development of these people when they came. The relics of their arts, falling in the classification of *neolithic*, gives color to the assumption that they were already mound-builders on their arrival, and flourished here for some centuries, and were found by De Soto in the decadence of their ancient practices.

To meet the insuperable negative argument of Mr. Henshaw, that no relics of the Indian's use or knowledge of ivory have yet been found here, you say: "At the era of the Mound-builders [who are presumed to have made the elephant pipes] the elephant and mastodon must have nearly reached the point of extinction on this continent, and hence would be infrequently seen, and the article of 'ivory' quite uncommon." Yet you marshal an array of many instances, and profess to be able to produce many more, of the remains of man and the elephant found together, in proof that the two must have been coeval here for a great length of time. Perhaps you would have us understand that the human remains found with the mastodon's were not those of the cultured (?) Mound-builder, but of a race of wild Indians who were here prior to the coming of the Mound-builder? This position granted, I would ask why it is that this primitive race, dominant here for ages, when elephants and mastodons were plentiful, did not learn to use ivory, or leave us some record of their acquaintance with the great beasts? We have learned that, in Central Africa, the most degraded and beast-like cannibal tribes, who are the least removed from mere simian intelligence, work ivory into beautiful ornaments and weapons. The Root-diggers of thirty years ago, admittedly the lowest known people of our continent, went naked, and subsisted on roots, acorns, and vermin — like animals; yet they manufactured beautiful weapons and ornaments of sea-shells, stone, bone, etc. And we are expected to believe that the Mound-builders, who wrought the most refractory stones into surprising shapes of elegance and artistic beauty; who traveled hundreds of miles for mica and sea-shells, and made all materials, from rushes to hematite and copper, tributes to their arts.—and yet failed to utilize the ivory (that finest of all substances for their purposes) of the few mastodons they occasionally killed or found dead! We are expected to believe that the Indians who — according to Dr. Albert Koch — killed the great mastodon they found mired in the Bourbeuse bottom with fire and with flint weapons, feasted on his flesh, but left his immense ivory tusks untouched. Is it not reasonable to believe that the very scarcity of mastodons would, when one was seen by the cultured (?) Mound-builders, inspire them

with such wonder and awe as to cause them to make some memorial of it, as they did of the mythical Piasa? or by imitation of it in pottery? or by their common method of sculptured foot-prints? Surely, a people of such imagination and superstition as was characteristic of the mound-building Indians, would have perpetuated the appearance of these huge monsters in other forms than these two pipes of soft sandstone, defective in the most prominent feature of the animal—its tusks.

In conclusion, I need scarcely state that I fully agree with Sir John Lubbock, that "there does not, as yet, appear any satisfactory proof that man coëxisted in America with the mammoth and mastodon." ("Prehistoric Times," first edition, page 236.) The author of your two elephant pipes may have seen a living female elephant, or a crude school-book engraving of it, perhaps at Honfleur, or Dieppe, or Paris, or elsewhere. Their antiquity, in my opinion, can in no event exceed—more probably falls short of—the early amalgamation with the trans-Mississippi Indians of the *courcurs de bois*, whom neither the power of Cartier or Champlain, nor the authority of the Church, could control.

I have not seen your inscribed tablets; but assuming the faithfulness of their representation in the second volume of Proceedings of the Davenport Academy, I would, without hesitation, relegate them to the class of so-called relics to which the Grave Creek tablet and the Lenape stone belong.

J. F. SNYDER, M.D.

From PROF. W. J. MCGEE, U. S. Geological Survey, Washington, D. C.

[As a citizen of our State and a member of our Academy, Professor McGee is held in high esteem, and with all his associates here his utterances will always have respectful consideration. While, in this instance, we have been compelled to disregard his counsel, we have no reason to doubt his entire sincerity. With Professor McGee's permission, we now present our readers with his correspondence having reference to the questions under discussion. The fact that it was not intended for publication renders it no less valuable.]

DEPARTMENT OF THE INTERIOR.

UNITED STATES GEOLOGICAL SURVEY, }
WASHINGTON, D. C., April 8, 1885. }

JUDGE CHARLES E. PUTNÁM, *Woodlawn, Davenport, Iowa*,—

My Dear Sir: I have great pleasure in acknowledging the receipt of your "Vindication of the Authenticity of the Elephant Pipes and Inscribed Tablets" in the Davenport Academy, together with the copy of the *Daily Democrat* containing an editorial relating thereto. I have read both with great interest, but, I must confess, a good deal of pain.

Certainly the Academy has nothing to gain from controversy with the Smithsonian Institution, with the Bureau of Ethnology, with Major Powell, or with Mr. Henshaw; and it appears to me that the tone of your vindication is controversial rather than judicial.

The Bureau of Ethnology is endowed with money and brains, and, by virtue of its connection with the Smithsonian Institution, as well as the eminence of its Director, must be regarded as one of the leading, if not *the* leading anthropologic institution in this country. Its friendship and coöperation are therefore valuable to all other such institu-

tions throughout the country, while its enmity will prove doubly disadvantageous in consequence of the high esteem in which it is deservedly held abroad. Thus far the history of the Davenport Academy has been one of successes. It has encountered obstacles, but these have been successfully surmounted; and it has made for itself a reputation for energy, industry, and thoroughly scientific merit—such a reputation as is not easily tarnished. I am therefore sorry that it was not deemed best by the members of the Academy to either ignore the mistakes and supposed personal thrusts contained in the Second Ethnologic Annual, or, at most, to respond to them through the columns of some scientific journal in a judicial, dispassionate rejoinder of a page or two.

Please understand that in thus expressing my feelings I express the sentiments of a firm friend of the Academy and a citizen of the State. My feelings are also, perhaps, determined, to some extent, by my principles in regard to the ethics of science. I maintain that in scientific work the *ego* should be forgotten, that scientific credit is an idle figment, and that individual names should appear only as a means of fixing responsibility. I realize that identical views were probably presented by some of your members in the discussions relating to the matter, and that your course was decided upon by consense among members and friends of the Academy; and I do not criticise your course, but rather, as I have already intimated, express the feelings of one of the members of the Academy.

Now that the pamphlet has been published, and it is proposed by the Academy to distribute it as widely as possible, I am quite willing to do my share. I should like, therefore, to have you forward me two or three additional copies. At least two gentlemen who are interested in the matter, knowing that I have some connection with the Davenport Academy, have applied to me for copies. I should like to be able to meet such requests in the future.

Please convey my kindest regards to your family, particularly Mrs. Putnam, to whom I am deeply indebted. My debt to her shall, however, be partly repaid within a few days.

With best wishes for the Academy, I beg to remain

Sincerely yours,

W. J. MCGEE, *Geologist*.

DAVENPORT, IOWA, April 11, 1885.

W. J. MCGEE, *Geologist, Department of the Interior, United States Geological Survey, Washington, D. C.,—*

My Dear Sir: Your valued favor of the 8th instant was received this morning. From your emphatic condemnation, during your last visit here, of the "careless statements" of Mr. Henshaw, we relied upon your support, and hence the tone of your letter was quite a surprise. However, we all feel that it would, after all, be quite unreasonable in us to expect more in view of your present environments.

We note with entire good nature your strictures upon the style and manner of our vindication. Our action, however, was well considered,

and the manner in which it has been received by archaeologists assures us of the wisdom of our decision. Throughout the extensive correspondence now before me, our "Vindication" is strongly commended as exceedingly temperate and satisfactory. It was certainly "judicial," in that it gave both parties in this archaeological war a fair hearing; and in this connection, my dear sir, you must permit me to say that to characterize as "controversial" an exposure of error and falsehood was scarcely judicious on your part.

We notice with curious interest your use of the terms "friendship" and "enmity" as applied to the Bureau of Ethnology. Was not this an inadvertence? The *present management* may entertain these merely human feelings, but *the Bureau itself*, as the embodiment of pure science, should be above such weaknesses. "In scientific work," you know, "the *ego* should be forgotten!" While you warn us of the danger of incurring the enmity of the Bureau, you also admit that in the volume under discussion it made "mistakes;" and we feel that, inasmuch as we have truth on our side, the Bureau cannot fail, in the end, to do us justice.

Moreover, it may be added, in conclusion, if the Henshaw paper is a product of the *friendship* of the Bureau, the Davenport Academy has little to dread from its *enmity*. A more insidious and malignant attack could not have been made by its worst enemy.

We are much gratified at the interest your friends are taking in our "Vindication," and I have handed your letter to Mr. Pratt with the request that he should forward the copies you desire. Thanking you for the friendly interest you have taken in our affairs, I remain

Very sincerely yours,

PROF. W. J. MCGEE.

CHARLES E. PUTNAM.

DEPARTMENT OF THE INTERIOR.

UNITED STATES GEOLOGICAL SURVEY, }

WASHINGTON, D. C., April 14, 1885. }

My Dear Sir: Your valued favor of the 11th instant is this moment at hand. I learn from it with regret that the tone of my letter of the 8th instant cannot have fairly represented my feelings. As I intimated in that letter, if I had taken part in the counsels of the Academy, I should have advocated the publication of a briefer and more impersonal vindication; but, as my remarks during my last delightful visit to Davenport expressed, and as I intended that the tone of my letter should imply, I regarded, and still regard, some vindication as urgently demanded. From my acquaintance with those who have taken part in the vindication, I am convinced that your action was "well considered;" and I do not doubt that, had I been present during the discussions in relation to the subject, I should have acquiesced in the general judgment and freely borne my share of the onus of the defense. Indeed, I have orally defended the Academy in this matter, as well as your vindication, in much stronger terms than my last letter may have indi-

cated; and I deeply regret your inference that you cannot rely upon my support in this as in other matters.

Under existing social conditions no human institution can be absolutely divorced from its founders and leaders; and accordingly, though personally I hold the *ego* to be of subordinate importance, it seems to me to be admissible to speak of "friendship," "enmity," and other human sentiments in connection with such institutions. So the coöperation that has existed between the Bureau of Ethnology and your Academy may be regarded as an expression of the "friendship" existing between these institutions. However, it is not worth while to discuss an immaterial point. Certainly we are agreed in this — that some vindication was so urgently demanded that the matter could not be ignored by the Academy.

It was only the personal element that enters into your vindication that I thought of characterizing as controversial. The entire document is judicial in the sense in which you use the term, for it unquestionably contains so full a statement of the questions at issue as to afford the public generally the means of deciding independently upon the merits of the case.

I am pleased to learn that the course of the Academy has received so general commendation from archæologists, and trust the effect of the episode will be to augment the high esteem in which the Academy is already justly held at home and abroad.

I have pleasure in acknowledging receipt of three additional copies of the "Vindication." I will see that they are well placed.

Believe me to remain, my dear sir,

Very truly yours,

W. J. MCGEE, *Geologist.*

JUDGE C. E. PUTNAM,

Woodlawn, Davenport, Iowa.

From PROF. SPENCER F. BAIRD, Secretary of the Smithsonian Institution, Washington, D. C.

[With the understanding that the Bureau of Ethnology was under the control of the Smithsonian Institution, and entertaining a very high opinion of the exact scholarship and profound scientific attainments of its distinguished Secretary, we sought to ascertain how it happened that so faulty and unscientific a paper as that of Mr. Henshaw's should have been included in a Government publication. The results of our investigations, as disclosed in the following correspondence, will be read with interest.]

DAVENPORT, IOWA, May 31, 1885.

PROF. SPENCER F. BAIRD, *Secretary of the Smithsonian Institution, Washington, D. C.,—*

Dear Sir: During the past summer an eminent archæologist directed our attention to an attack made upon our Academy by Henry W. Henshaw in the Second Annual Report of the Bureau of Ethnology, and kindly forwarded us a copy of the publication which *he* had received from the Bureau, for our inspection. In expressing his condemnation of this paper, this gentleman strongly advised us to have the matter presented as a proper subject for Congressional inquiry. After careful consideration, however, we decided upon a different course,

and the result is the little pamphlet I send you herewith. As one has before this been forwarded to your address, it has perhaps already fallen under your observation, but I send you another copy in connection with this communication, as it will render unnecessary any further statement of facts, and will present with sufficient clearness our special grievances.

The force of this attack was very greatly augmented by the connection of the Bureau of Ethnology with the Smithsonian Institution, and I therefore take the liberty of writing to ascertain whether this paper of Mr. Henshaw's is approved and endorsed by your Institution, or by yourself. In making these inquiries, perhaps I ought to say we have in view a revision of our pamphlet for another edition, which will probably be required in the near future, and awaiting with interest your answer to these inquiries, I remain,

Very respectfully yours,

CHAS. E. PUTNAM.

SMITHSONIAN INSTITUTION, {
WASHINGTON, D. C., June 4, 1885. }

Dear Sir: I am in receipt of your letter of May 31st, announcing the transmission of a pamphlet in reply to an article by Mr. Henshaw, and which I had previously read with much interest. I have sent a copy of your letter to Major Powell for his consideration.

Respectfully,

SPENCER F. BAIRD.

C. E. PUTNAM, ESQ., *Davenport, Iowa.*

DAVENPORT, IOWA, August 26, 1885.

PROF. SPENCER F. BAIRD, *Secretary Smithsonian Institution, Washington, D. C.,—*

My Dear Sir: On the 31st of May last I took the liberty of calling your attention to an article entitled "Animal Carvings from Mounds in the Mississippi Valley," by Henry W. Henshaw, and appearing in the Second Annual Report of the Bureau of Ethnology. As this paper assailed the authenticity of relics in our museum, and the honesty of members of our Academy, I was thereby impelled to submit for your careful consideration the following inquiry: "The force of this attack was very greatly augmented by the connection of the Bureau of Ethnology with the Smithsonian Institution, and I therefore take the liberty of writing to ascertain whether this paper of Mr. Henshaw's is approved and endorsed by your Institution, or by yourself."

This inquiry, I am sure, was entirely proper. You occupy a high official position in the administration of a great educational trust, and it is considered that every citizen who is engaged in scientific work is entitled to share in its advantages. It was therefore with surprise I received and read the following laconic reply to my inquiry:

"I am in receipt of your letter of May 31st, announcing the transmission of a pamphlet in reply to an article by Mr. Henshaw, and which I had previously read with interest. I have sent a copy of your letter to Major Powell for his consideration."

Inasmuch as Major Powell was implicated with Mr. Henshaw in the commission of the wrong of which we complain, this reference of the matter back to him was, to say the least, a singular disposition of my inquiry. I have, however, been awaiting with curious interest the result. As no report thereon from Major Powell has been communicated to me, it is reasonable to conclude he has no answer to make. Now, my dear sir, you must pardon me the observation that, in a matter of so much importance, we were entitled to a full and frank answer to our inquiry.

Here was a Bureau working under your supervision, and here was its official report ushered into the world of science with your apparent endorsement; and, either by mistake or design, this publication contained a paper in no sense an original scientific investigation, but made up of newspaper and magazine gossip, and showing a deplorable ignorance of all essential facts. Mr. Henshaw never saw the objects he undertook to criticise, was wholly unacquainted with the discoverers and with the members of our Academy, never made an inquiry of either, and yet, with amazing audacity, he pronounces the relics in question to be forgeries, charges the explorers with the practice of jugglery in making their pretended discoveries, and, in his endeavor to fasten the stigma of fraud upon our Academy, he has the seeming support of the Smithsonian Institution!

Entertaining for the great Institution under your charge a most sincere admiration, and for yourself, personally, the highest respect, and anxious to do no injustice to any of the parties involved, I decided to ascertain whether there could be any satisfactory explanation of this singular publication, and hence my inquiry. Now, if Mr. Henshaw's work is thoroughly scientific, and is entitled to publication at public expense, then clearly he should receive your open endorsement — and certainly he needs it! If, on the contrary, his work is found to be unscientific, its publication an oversight, and that thereby a great wrong has been done to honest investigators, then simple justice would seem to demand that this blunder should be promptly disavowed, and the injury amply retrieved. The Smithsonian Institution, great as it is, cannot afford to shield either wrong-doer or wrong-doing. If Mr. Henshaw has perpetrated a libel under cover of a Government publication, then clearly we are entitled to have his retraction given to the world in the same imposing manner.

The questions involved, you will perceive, are of vital importance to all persons engaged in scientific research. In, therefore, asking of you a careful reconsideration of the inquiry I have submitted, I trust you will not consider me intrusive.

We have received a large number of communications from archæologists in this country and Europe concerning this Henshaw paper, and,

as they have great scientific value, we have it in contemplation to publish the more important of them in connection with the fourth volume of our Proceedings, now in press. We shall, of course, expect to include this correspondence; and now, awaiting with interest your further reply to my inquiry, I remain,

Very respectfully yours,

CHAS. E. PUTNAM.

SMITHSONIAN INSTITUTION,)
WASHINGTON, D. C., Sept. 16, 1885. }

CHARLES E. PUTNAM, ESQ., *President of the Davenport Academy of Natural Sciences, Davenport, Iowa*,—

Dear Sir: I have before me your communication of August 26, and take pleasure in answering the inquiries which it contains.

The Smithsonian Institution, like other institutions and societies of a similar character, assumes no responsibility whatever for the accuracy of papers published under its auspices. Still less does it undertake to endorse or to defend the conclusions and theories advanced by their authors. The fact that a paper has been published in a volume which bears upon its title-page the name of the Institution does not therefore imply that it has the endorsement or approval of the Institution, nor does it, in my judgment, "augment the force" of any criticisms which it may contain. Such papers must stand or fall upon their own merits, exactly as if published in the proceedings of a society or in one of our scientific journals.

The Smithsonian Institution, in its most formal series of publications—"The Smithsonian Contributions to Knowledge"—expressly and officially disclaims responsibility for the contents of each separate paper, notwithstanding the fact that every one of these papers has been submitted for approval to a committee of three competent specialists.

The Report of the Bureau of Ethnology is prepared under the supervision of its Director, Major J. W. Powell, and although it is, as a matter of official form, addressed to the Secretary of the Smithsonian Institution, he has nothing whatever to do with its preparation, nor has he any supervision of its contents.

You will readily understand, then, why I cannot undertake to express any opinion concerning the publications of the Bureau of Ethnology, when the direct publications of the Institution are understood to stand so completely upon their own merits. The Director of the Bureau of Ethnology, as I have previously informed you, is the person to whom all requests for such information should be addressed.

Having answered your inquiry as to the official connection of the Smithsonian Institution with the publications in question, I may further say that I am not prepared to express an intelligent personal opinion as to the antiquity of the objects under discussion, since I have not had time nor opportunity to investigate the subject. The results of further mound exploration will probably, within a few years, give evidence of great weight for or against the authenticity of the Davenport pipes.

I am glad, however, of this opportunity to say that I have never had other than the utmost confidence in the good faith and integrity of those members of your Academy who have been engaged in the study of the relics in question. I deeply regret that the discussion of a scientific problem should have become embarrassed by considerations of a personal nature. I assure you that you could not fall into a graver error than to suppose that any "endeavor to fasten the stigma of fraud upon the Academy" could have the sympathy or "seeming support of the Smithsonian Institution." I am, sir,

Yours very respectfully,

SPENCER F. BAIRD, *Secretary*.

DAVENPORT, IOWA, October 23, 1885.

PROF. SPENCER F. BAIRD, *Secretary Smithsonian Institution, Washington, D. C.*,—

Dear Sir: In the view I have taken of the connection between the so-called "Bureau of Ethnology" and the Smithsonian Institution, I feel confident I have fallen into no error, but, when confronted with the positive denial in your communication of September 16th last, I delayed replying until I could find leisure to make a careful reëxamination of the records.

I now find that in the year 1879 Congress passed a law consolidating the separate Surveys under one management; that previous to that date ethnological investigation had been conducted principally in connection with the Rocky Mountain explorations; that under this law all collections thus made were turned over to the Smithsonian Institution, and that by provision of subsequent acts these explorations were to be continued under its supervision. Thus, the act of March 3d, 1879, provided: "That all the archives, records, and material relating to the Indians of North America, collected by the Geographical and Geological Survey of the Rocky Mountain region, *shall be turned over to the Smithsonian Institution, that the work may be completed and prepared for publication under its direction.*"

The various appropriation acts subsequently passed by Congress contained provisions substantially like the following, taken from the act of August 7th, 1882:

"For North American Ethnology, Smithsonian Institution: For the purpose of continuing ethnological researches among the North American Indians, *under the direction of the Secretary of the Smithsonian Institution*, including salaries and compensation of all necessary employés, thirty-five thousand dollars."

And in the Smithsonian Report for the same year (1882) your own views concerning this department are thus clearly stated:

"As in previous years, I propose to include in the present report, in addition to matters pertaining strictly to the Institution, a brief account of the operations of the National Museum, *and of the Bureau of Ethnology, which may be considered as part of the Smithsonian Institution.*"

In the "Introductory" to the First Annual Report of the Bureau of Ethnology, Major Powell himself explains the origin of this so-called "bureau," and there states that "*the Secretary of the Smithsonian Institution intrusted its management to the former director of the survey of the Rocky Mountain region.*" It thus plainly appears that Major Powell, in his own estimation, occupies his present position at the head of that department, by appointment of the Secretary of the Smithsonian Institution. It further as plainly appears that the Bureau of Ethnology has no legal existence except as a department of the Smithsonian Institution.

Inasmuch as the appropriations are also made by Congress upon the express condition that this work is to be performed under your "*direction*," the statement you now make concerning one of its official reports that "*the Secretary of the Smithsonian Institution has nothing whatever to do with its preparation, nor has he any supervision of its contents,*" will occasion surprise, and may serve to disclose an unperformed duty.

My previous assumption, therefore, that "the force of this attack was very greatly augmented by the connection of the Bureau of Ethnology with the Smithsonian Institution," seems after all to be well founded. Mr. Henshaw was an employé in this department, receiving a stated salary, and presumed in his utterance to represent the views of his superiors. Thus, going forth stamped with the name of your institution, the statements in his paper would pass unchallenged into the world of science. Mr. Henshaw derived importance from his environments. "Strip him of his plumage and you fix him to the earth." If, as the law clearly contemplates, Mr. Henshaw is working under your "direction," then must his paper have derived importance from your name and fame.

The American Congress in taking these ethnological researches away from the Geological Survey, and placing them under the direct supervision of one of the foremost scholars of our country, acted with wise forethought. To a gentleman like yourself, accustomed to precision in the use of language, it will not be necessary to discuss the force and significance of the expression used by our law-makers in enacting that in future these ethnological researches should be conducted under the "direction" of the Secretary of our great scientific institution. It was never contemplated, I am sure, that the connection thus established *could* be regarded by any one, and above all, by yourself, as an airy nothing, a mere legal fiction.

In your communication you disclaim all responsibility for the accuracy of papers published by or under the auspices of the Smithsonian Institution itself, and disavow any obligation to either indorse or defend the conclusions and theories of the writers. This position is so evidently correct it scarcely required restatement. It will readily be conceded that all its scientific papers accepted for publication "must stand or fall upon their own merits." There is, however, a limit to your freedom from responsibility, which, as stated in your own rules, involves the precise question I have raised in this correspondence. This regulation concerning your publications is thus stated:

"It is impossible in most cases to verify the statements of an author, and therefore *neither the Commission nor the Institution can be responsible for more than the general character of a memoir.*"

Your Institution therefore accepts responsibility for the "*general character*" of its publications, and this, you will concede, would require the exclusion of all libelous, scurrilous, and unscientific papers. Now, therefore, should there appear among your publications an article assailing a scientific society without reason, charging fraud upon its members without proof, made up of second-hand information without scientific merit, the American public would be justified in holding your Institution derelict in duty. That such was the "general character" of Mr. Henshaw's paper must be evident when so excellent an archæologist as Professor Peet, of the *American Antiquarian*, says of it: "We should have considered it a libel if it was said of us." And again: "There is scarcely a truthful or convincing paragraph in the whole article, and many of the remarks are as careless and groundless as they can well be." And when so exact and careful a writer as Dr. D. G. Brinton thus condemns it: "A would-be critical article on 'Animal Carvings from Mounds in the Mississippi Valley' is inserted from the pen of Henry W. Henshaw. It would have been of more weight had the writer known more of his topic from personal observation, and depended less on second-hand statements. The Bureau should confine its writers to what they know of their own knowledge." And again: "From my first reading of his article I concluded it a paper not composed in the true spirit of science, and out of place in the publications of the Bureau." And when so eminent an authority in anthropology as Prof. Otis T. Mason, of the National Museum, hurls at it this stinging anathema: "*The last word that should fall from the lips of a brother naturalist is 'fraud!'*" These few citations, from the vast number at hand, will justify me in assuming that, without the aid of a "Commission," the Secretary of the Smithsonian Institution, on account of its faulty "general character," must have promptly condemned this paper as wholly unworthy of publication.

In your closing paragraph you fail to distinguish between the "antiquity" and the "authenticity" of the relics in question. This distinction has been carefully observed in the statements we have made, and, so far as our Academy is concerned, the "authenticity" of our relics is the only question under discussion. Among experienced archæologists the "antiquity" of all mound relics is yet an open question, upon which widely conflicting views are entertained. The "authenticity" of the relics in question we consider fully established; but, reversing your own expression, we cheerfully concede that the results of further mound explorations will probably within a few years give evidence of great weight for or against the "antiquity" of the Davenport pipes. Their "authenticity" established, they certainly bear strong internal evidence of great antiquity, and should it be established by other discoveries that man and the mastodon were contemporary on this continent, scientific skeptics will then have no further occasion to question either their authenticity or antiquity.

I heartily join with you in the expression of a regret that the discussion of these interesting scientific problems should have become embarrassed by considerations of a *personal* nature, and doubtless you would join with me in the further statement that by the introduction of ordinary billingsgate into a serious scientific publication, Mr. Henshaw had fairly exposed himself to the just censure and condemnation of all earnest students of science.

I read with pleasure and gratification your endorsement of our Academy, and your expressions of confidence in the good faith and integrity of its members, and as this of itself is a condemnation of Mr. Henshaw's methods, it renders any further answer to my inquiries unnecessary.

Thanking you for your courteous attentions, and craving pardon for these tedious intrusions upon your valuable time, I remain

Very respectfully yours,

CHAS. E. PUTNAM.

PROF. SPENCER F. BAIRD.

As no answer was received, this correspondence closed with the above letter. The silence of the distinguished Secretary, it must be acknowledged, is sufficiently significant; and, no doubt, it was unreasonable in us, under the circumstances, to expect a more specific response to our inquiry. It is, however, becoming uncomfortably evident to the many friends and admirers of the Smithsonian Institution that its connection with the so-called Bureau of Ethnology is a source of embarrassment and a drag upon its progress; and, among its other reforms, the present American Congress could do no better work than by promptly severing this entangling alliance, forced upon the Smithsonian Institution by a former administration. By so doing it would save to the National Treasury an annual expenditure of \$40,000.00; it would protect from taint and injury our great scientific institution; it would give greater freedom to archæological research; it would purify the cause of science.

CRITICISMS OF SCIENTIFIC JOURNALS.

The controversy forced upon the Davenport Academy by the accusations of the Bureau of Ethnology has attracted very general attention and been made the subject of frequent newspaper comment. It is not, however, our intention to include herein the many kindly notices we have received from the popular press, and we shall now strictly limit ourselves to a brief presentation of the views and statements of the more conservative scientific journals:

The American Antiquarian.

"We next read the article by Mr. Henry W. Henshaw, 'Animal Carvings from the Mounds of the Mississippi Valley.' We recognize the cuts, which have become so familiar, and agree with the writer in many of his conclusions, but prefer to leave some questions open. He is certainly insinuating a great deal when the writer says that the discoverer of the elephant pipes and inscribed tablets at Davenport had a remarkable 'archæologic instinct and the aid of his divining-rod' when making his discoveries, as if he was guilty of an intentional fraud. We should consider it a libel if it was said of us."—REV. STEPHEN D. PEET, *March*, 1885.

"MR. HENSHAW AND MOUND-BUILDERS' PIPES. — The pamphlet on Mound-builders' pipes, by Mr. C. E. Putnam, has awakened very much interest among archæologists of this country and Europe. The attack upon the society by Mr. Henshaw, which was published in the second report of the Ethnological Bureau, seems to have aroused indignation in many different quarters. The letters which have been received by Mr. Putnam, congratulating him on the boldness of his defense, are not only numerous, but from the very best sources. The more we read Mr. Henshaw's article, the more pretentious and groundless do the positions of the writer seem. There is scarcely a truthful or convincing paragraph in the whole article, and many of the remarks are as careless and groundless as they can well be. Mr. Henshaw would better have confined his attention to his own department of ornithology, or else have been a little more modest in entering upon the department of archæology. The arrogance which he has exhibited is certainly not a good introduction for him in the new field. The wonder is that Major Powell, the chief of the Bureau, should not have seen the carelessness of his statements and noticed the supercilious air with which he has treated archæologists generally. Written by assistant and endorsed by

the chief, the article is destined to produce mischief and arouse prejudice against the Bureau. Mr. Henshaw evidently owes an apology to the Davenport society.”—REV. STEPHEN D. PEET, *July, 1885*.

Pacific Science Monthly.

“From Charles E. Putnam, President of the Davenport Academy of Sciences, we have received a pamphlet of forty pages relating to elephant pipes found in that vicinity. The Bureau of Ethnology, Washington, made an attack upon these finds, calling in question their genuineness, to which Mr. Putnam replies in an incisive way that will doubtless cause the Washington relic sharps to look a ‘leedle out.’ The first of these pipes is said to have been plowed up in a corn-field in Louisa County, Iowa, in 1873, by Peter Mare, a German farmer. The other was discovered in March, 1880, in a mound, in the same county, by Rev. A. Blumer, a Lutheran clergyman. Rev. J. Gass, a Mr. Hass, and several workmen were present. These gentlemen are said to be irreproachable in character, and Mr. Gass is a member of the Academy. The men who made these discoveries, and the circumstances connected therewith, warrant the conclusion that they are genuine finds, and that no deception whatever has been practiced in the matter. Mr. Putnam has certainly made out his case, and it seems to us that he removes every reasonable doubt as to their being genuine. Antiquarians generally seem to overlook the fact that the mastodon existed upon this continent in comparatively recent times. A skeleton was found in excavating the bed of a canal a few miles north of Covington, Fountain County, Indiana, bedded in wet peat, the larger bones containing the marrow, which was used by the workmen to ‘grease’ their boots. Chunks of adipocere, $2\frac{1}{2} \times 3$ inches, occupied the place of the kidney fat of the monster. But five years ago the remains of a mastodon were found in Iroquois County, Illinois, between the ribs of which was found a mass of herbs and grasses similar to those which still grow in that vicinity. In the same bed of clay was found land and fresh-water shells such as still exist in that locality to the present time. Evidences of this kind can be furnished from many places; hence it is not improbable that man and the mastodon have existed together upon this continent within the past five thousand years. We are aware that these views will be pooh-poohed and waved aside by some who, in their self-sufficiency, believe that archæological wisdom will be a thing of the past when they die; nevertheless, our position is tenable and fully susceptible of proof, we think. The *savants* of Washington have doubtless been hasty in their condemnation of the finds we have been considering.”—STEPHEN BOWERS, PH.D., *May, 1885*.

The Young Mineralogist and Antiquarian.

“We believe an article in the Second Annual Report of the Bureau of Ethnology to be open to severe criticism. The Bureau, under the management of Major J. W. Powell, has recently taken the decided position that the Mound-builders were nothing more nor less than the

ancestors of the various tribes of aborigines who were found inhabiting this continent by Columbus. Whether or not the Bureau is justified, by the possession of undeniable and sufficient evidence, in taking this decided stand, is left to the reader's judgment. In our opinion, based on careful perusal of the evidence cited by the capable members of the Bureau, they are not. The question of the Mound-builders' identity is yet an open one, and may remain so for some time to come; and although every archaeologist has a theory based on certain indications, no matter how learned, no one has proven his theory in a manner satisfactory to all. The theories of to-day are all liable to be overthrown by the discoveries of to-morrow, as history shows. The Davenport Academy of Sciences has recently brought to light some very interesting and remarkable relics in the shape of two elephant pipes and three inscribed tablets. The discovery of these was made at various times by gentlemen who donated the relics to this Academy. Two of the inscribed tablets were found near the city of Davenport, Iowa, on January 10th, 1877, by Rev. J. Gass. An exact and careful statement of the facts connected with the discovery may be found in 'Proceedings Davenport Academy of Natural Sciences,' Vol. II., p. 96. The statements made by the discoverer were fully verified by members of the Academy, who personally examined the surroundings, etc. The testimony of the genuineness of the pipe is clear and convincing. Of the elephant pipes, one was discovered in March, 1880, in a mound on the farm of Mr. P. Hass, in Louisa County, Iowa, by Rev. A. Blumer, and was by him announced to the Academy. The other was obtained from a farmer in Louisa County, Iowa. From what we are able to learn of the relics, there are no suspicious circumstances connected with the finding of them. And this is not the only authentic discovery of elephant pipes; other discoveries have been made, showing that the Mound-builders were contemporary with the mastodon; for example, the much-written-about 'elephant mound' in Wisconsin. But the Bureau had all along saw fit to discredit the authenticity of these relics; therefore (and here we come to the point), when the last discovery was made, the Bureau considered it necessary to at once attack their authenticity. For this purpose a gentleman named H. W. Henshaw was introduced to archaeologists, by Major Powell, as 'skilled as a naturalist, but especially as an ornithologist,' and strongly endorsed by Major Powell as being capable of subjecting the methods and discoveries of the Davenport Academy of Sciences to 'destructive criticism.' We do not see this destructive criticism. Mr. Henshaw does not seem to have taken very great pains to inform himself of the facts in the case, but confines himself to such arguments as that 'the explorer was alone when he made the discovery.' This is no argument at all, and, more than that, the facts clearly show that no less than six highly respected persons were engaged in these explorations, and no less than three were present at each discovery. If every relic discovered by persons who were alone when they made the discovery should be thrown out as unauthentic, many of the most remarkable relics in our museums would have to be thrown out. We give a characteristic pass-

age from Mr. Henshaw's article: 'Archæologists must certainly deem it unfortunate that, outside of the Wisconsin mound, the only evidence of the coëxistence of the Mound-builder and the mastodon should reach the scientific world through the agency of one individual. So derived, each succeeding carving of the mastodon, be it more or less accurate, instead of being accepted by archæologists as cumulative evidence tending to establish the genuineness of the sculptured testimony showing that the Mound-builders and the mastodon were coeval, will be viewed with ever-increasing suspicion.' If we are not mistaken, these are sentiments decidedly new to the scientific world. They have the strong endorsement of the Director of the Bureau of Ethnology."—T. H. WISE, *April, 1885*.

Iowa Historical Record.

"We have received a copy of a neat pamphlet of thirty-eight pages, illustrated, entitled 'Elephant Pipes in the Museum of the Academy of Natural Sciences, Davenport, Iowa,' by Charles E. Putnam, which is a vindication of the authenticity of the elephant pipes and inscribed tablets in the museum of the Davenport Academy of Natural Sciences from the accusations of the Bureau of Ethnology of the Smithsonian Institution. The author, who is President of the Davenport Academy, presents in a clear and caustic manner a mass of testimony to prove the genuineness of those unique specimens, which have been called in question. Aside from the high standing of the individual members of the Davenport Academy, their work is one which is pursued for the love of it alone, and it would seem impossible to assign a motive for their practicing a willful deception. Iowa, some years ago, produced the Cardiff Giant, an ingenious hoax having its origin in cupidity, and it is only quite lately that some fiction dealer deceived many people by a description of a monster animal alleged to have been discovered invading a farmer's premises and despoiling him of his fattest hogs. These impostures are akin to the hoax perpetrated on the astronomers years ago by a New England sham, who claimed to have detected living animals on the surface of the moon, and we hope have not in any way prejudiced the Davenport Academy in the eyes of the Smithsonian Institution. The latter we hope will find ample warrant in reversing their judgment when they read the able pamphlet from the pen of Mr. Putnam."—*April, 1885*.

The Pennsylvania Magazine.

"SECOND ANNUAL REPORT OF THE BUREAU OF ETHNOLOGY, 1880-81. By J. W. Powell, Director. Washington, 1883. Large 8vo, pp. 477.

"It may appear somewhat late to notice a book which professes to have been issued in 1883; but this date is one of the mysteries which surround the work of the Government printing-office. In point of fact, it is only within the last few months that this report of 1880 has been accessible to the public. Its merits, however, make amends for its tardiness. There are several articles in it which stand in the first rank of importance in American archæology and ethnology.

"As first in value we mention the excellent paper on 'Art in Shell of the Ancient Americans,' by William H. Holmes. His resolution of the peculiar and obscure artistic designs which he figures is as ingenious as it is convincing. The analogy of the decoration and drawings on shells from Missouri and Georgia to the art-work of the Mayas of Yucatan is altogether too positive to be attributable to chance or to parallelism of art evolution. Its explanation demands a historic unity of culture.

"The aptitude for artistic work in the native race is further illustrated by the article of Dr. Washington Matthews on 'Navajo Silversmiths.' He shows that they have not only technical dexterity, but original decorative conceptions as well.

"Mr. Frank H. Cushing contributes one of his studies of Zuñi life, in this instance on the Zuñi philosophy and their fetiches. It is a very curious illustration of the course of native thought directed toward the problems of religion.

"Similar to it in its subject is Mrs. Erminnie A. Smith's paper on the 'Myths of the Iroquois.' With due deference we must say, however, that the illustrations of this article, borrowed without credit from Cusick's well-known book (which has already appeared in a Government publication), are out of place in a report of the Bureau of Ethnology. Nor does Mrs. Smith improve on the quaint narrative of Cusick by dressing it up in modern English.

"A would-be critical article on 'Animal Carvings from the Mounds of the Mississippi Valley' is inserted from the pen of Henry W. Henshaw. It would have been of more weight had the writer known more of his topic from personal observation, and depended less on second-hand statements. The Bureau should confine its writers to what they know of their own knowledge.

"Two illustrated catalogues of collections from New Mexico, by James Stevenson, close the volume."—D. G. B., *April, 1885*.

The American Naturalist.

"Under the title 'Elephant Pipes in the Museum of the Academy of Natural Sciences, Davenport, Iowa,' Mr. Charles E. Putnam enters a vigorous and well-written protest against the criticisms and insinuations which have been made against the character of the discoverer and the authenticity of the elephant pipes in the museum of the Davenport Academy. The article is racy reading, and incidentally gives strong arguments against the desire for centralization in science shown in certain quarters. It will be found impossible to concentrate all science in any one clique or city. Our local societies and scattered observers need not feel that their efforts are not as valuable in their way as the labors of Government officials and closet or office naturalists."—*July, 1885*.

"THE DAVENPORT ELEPHANT PIPES.—Mr. Charles E. Putnam, of Davenport, Iowa, has published a pamphlet of thirty-eight pages as a vindication of the authenticity of the elephant pipes and inscribed tablets in the museum of the Davenport Academy of Natural Sciences

from the accusations of the Bureau of Ethnology of the Smithsonian Institution. Those who have known the history of the Davenport Academy, its struggles and triumphs for the love of pure science, and the extreme caution of its leading members, regretted that anything should appear in a Government publication reflecting upon their veracity or honesty. Tablets are common enough, being made of slate and other material, and worn to-day by the present Indians of British Columbia and Alaska. So long as they do not contain outlandish and unclassifiable inscriptions, there is nothing mysterious about them. On the contrary, the elephant pipes are mysteries. When I try to put the cast which we possess at the museum with something else, there is nothing to put with it. Professor Henry once said to one of his assistants who discovered an unclassifiable specimen: 'That seems to stand out so unsociably that we must call it an "outstanding phenomenon," and wait patiently until something else turns up to go with it.' 'The last word that should fall from the lips of a brother naturalist is 'fraud.'

"On the other hand, barring this indiscretion, Henshaw is just what Major Powell says about him. He is a very careful and skillful naturalist. We should hail with delight the accession of all such men to the ranks of archaeology, because they bring light from every side to bear upon our mysteries. It should not make a particle of difference to any of us whether a pipe is the figure of a crow or of a toucan, so long as we know just what it represents. We may rest assured that for a long time every mystery solved will be accompanied by two quite as inexplicable.

"But, really, too much account is being made of the matter. Squier and Davis are not overthrown. Their manatee, toucan, and paroquet may be shot down by the ornithologist, but these practical gentlemen did not care a fig about such creatures. They made the greatest archaeological survey and collections ever attempted in America, and their volume will indeed be a 'monument' to their memory and to the glory of its authors for all time.

"The Davenport Academy is not annihilated. Even if our theory should turn out true and the elephant pipe should prove a tapir pipe, and we should learn that tapirs once lived in the Mississippi Valley, this grand association would survive."—PROF. OTIS T. MASON, *August, 1885.*

The American Journal of Science.

"ELEPHANT PIPES IN THE MUSEUM OF NATURAL SCIENCES, DAVENPORT, IOWA, BY CHARLES E. PUTNAM.—This address, by the President of the Davenport Academy of Natural Sciences, was called forth especially by expressions of disbelief with regard to accounts of the discovery of 'elephant pipes' of soft sandstone and 'inscribed tablets' in Indian mounds of Iowa, published in the Proceedings of the Academy. Mr. Putnam makes the following statements with regard to the finding of these objects:

"The discoveries in question are two elephant pipes and three inscribed tablets. Of the latter the first two were found in what is known

as Mound No. 3, on the Cook farm, adjoining the city of Davenport. The principal discoverer was Rev. Jacob Gass, a Lutheran clergyman, then settled over a congregation in Davenport. In this exploration Mr. Gass was assisted by L. H. Willrodt and H. S. Stoltzenau, with five other persons who were accidentally present during the opening of the mound. The discovery was made on January 10th, 1877. An exact and careful statement of the facts connected therewith was soon after prepared by Rev. Mr. Gass, and read at an early meeting of the Davenport Academy. It was published, and may be found in its 'Proceedings.' Upon the announcement of the discovery, the officers and members of the Academy were early on the ground to verify the statements made by the discoverers. The gentlemen engaged in the exploration are well known and held in high esteem; their testimony as to all essential facts is clear and convincing, and the circumstances narrated seem to fully establish the genuineness of these relics. That their statement contains only facts all who know them will not question, and that the mound from which the relics were obtained had not been previously disturbed is sufficiently established by their testimony. The authenticity of this discovery must therefore be conceded by every fair-minded inquirer.

"The third inscribed tablet was found on January 30th, 1878, in Mound No. 11, in the group of mounds on Cook's farm, in the suburbs of Davenport, and in close proximity to the mound wherein the other tablets were discovered. That indefatigable explorer, Rev. J. Gass, was also present during these further researches, and had for his assistants John Hume and Charles E. Harrison, both members of the Academy, and well and favorably known in this community. The circumstances of this discovery, as narrated by Mr. Harrison, are published in the Proceedings of the Academy. No suspicions whatever attach to this discovery, and the well-attested facts connected therewith establish beyond reasonable doubt that, whether more or less ancient, the tablet was deposited at the making of the mound.

"Of the elephant pipes in the museum of the Academy, one was discovered in March, 1880, in a mound on the farm of Mr. P. Hass, in Louisa County, Iowa, by Rev. A. Blumer, a Lutheran clergyman from a neighboring city, and was by him donated to the Academy. Rev. J. Gass, Mr. F. Hass, and a number of workmen were present, assisting in the exploration. A detailed account of the finding, prepared by Rev. Mr. Blumer, is published in the Proceedings of the Academy. From the social standing and high character of the principal discoverers, no question has been, or can be, successfully raised as to the authenticity of this discovery. The other elephant pipe was not 'discovered' by Rev. J. Gass, but was obtained by him from a farmer in Louisa County, Iowa. This man found it while planting corn on his farm several years prior to that date, and attached no particular value to the relic, but had sometimes used it in smoking. A brief account of its finding is given in the Proceedings of the Academy. It will thus be perceived that there are no suspicious circumstances connected with either of these discoveries, but that the surrounding and well-

authenticated facts seem to sufficiently establish the genuineness of these interesting relics.

"Mr. Putnam observes that, 'their authenticity established, archaeologists will find in them strong corroborative testimony that man and the mastodon were contemporary on this continent.'

"The pamphlet closes with an appendix in which a figure is given of one of the elephant pipes. The form of the elephant, and the large ears and trunk, are unmistakable, but the tusks are wanting."—*May, 1885.*

Nature, London, England.

"The most recent contribution to the much-discussed question of the origin of the Mound-builders of the United States is a pamphlet by Mr. C. E. Putnam, issued by the Academy of Natural Sciences of Davenport, Iowa. The Bureau of Ethnology connected with the Smithsonian Institution champions the theory that the race which constructed these mounds may be traced to the ancestors of the present American Indians, while another school of archaeologists holds that the Mound-builders were more advanced in civilization than the American Indians, and have endeavored to trace them to a Mexican origin or to some common ancestry. This being the broad question at issue, the Davenport Academy, which appears to have adopted no theory on the subject, became possessors by donation of three inscribed tablets and two elephant pipes—*i. e.*, pipes with the figure of an elephant carved on them—which are stated to have been found in Iowa. In the words of Mr. Putnam, 'if their authenticity is established, then archaeologists will find in them strong corroborative evidence that man and the mastodon were contemporary on the American continent, and the Mound-builders were a race anterior to the ancestors of the present American Indians and of higher type and more advanced civilization.' But doubts have been cast on the authenticity of these curious relics by the Bureau of Ethnology, and the Davenport Academy has taken the matter up with some warmth. Mr. Putnam's pamphlet is the Academy's reply, and is a vigorous defense of the genuineness of the elephant pipes and inscribed tablets. It describes in detail the circumstances under which they were discovered, the witnesses present, etc., and lays especial stress on the fact that the two pipes were dug up at different times and places, by independent persons, one, at least, of whom had no notion of the value of the object. The whole subject is one of extraordinary interest, and Mr. Putnam's statement, vouched as it is by a formal resolution of the Davenport Academy, must play an important part in any subsequent discussion as to the value to be attached to these remains, which, if authentic, are acknowledged to have much influence on the final settlement of the question as to who the Mound-builders were."—*April 16th, 1885.*

SMITHSONIAN INSTITUTION.

In connection with the correspondence of Prof. Spencer F. Baird, Secretary of the Smithsonian Institution, hereinbefore presented, some communications of an earlier date from the same gentleman, concerning the shale tablets, should have been also included, as they have an important bearing upon the questions under discussion. They were, however, inadvertently omitted, and, though out of their proper order, will now be presented.

Upon the discovery of those tablets, the interesting event was immediately reported to Professor Baird, and by his request they were forwarded to Washington for his personal inspection. The tablets remained there during a session of the National Academy, were placed on exhibition and inspected by its members, and the results are stated by Professor Baird in these communications. In connection with the strong evidences of authenticity disclosed by the circumstances of the discovery, this favorable report from the Smithsonian Institution greatly influenced the subsequent action of the Davenport Academy in presenting these tablets to the scientific world as genuine mound-relics. Probably this would never have been seriously questioned but from the fact that one of these tablets has on it the tracing of a huge animal, generally supposed to represent a mammoth, and hence their authenticity has been made the object of a virulent attack by the Bureau of Ethnology. In now presenting these valuable communications we take the liberty of placing in italics certain passages to which we desire to call especial attention:

NATIONAL MUSEUM, SMITHSONIAN INSTITUTION, }
WASHINGTON, April 11, 1877. }

Dear Sir: The box of tablets came to hand in my absence in Florida, and was kept undisturbed until my return a few days ago, and when opened everything was found in first-rate condition. *There appears every indication of genuineness in the specimens, and the discovery is certainly one of very high interest.* We shall have photographs of

them made very soon. The National Academy meets here next week, when the specimens will be exhibited, and thereafter immediately returned.

Yours very truly,

SPENCER F. BAIRD.

W. H. PRATT, ESQ.,

Curator Davenport Academy of Sciences, Davenport, Iowa.

SMITHSONIAN INSTITUTION, 1

WASHINGTON, D. C., May 31, 1877. {

Dear Sir: I am in receipt of your letter of the 28th, and in reply beg to say that the duplicates were submitted informally to the members of the National Academy of Sciences, but that an official presentation was prevented by the crowd of other business that pressed it out of place. Most of the persons who examined them—among whom were Professor Haldeman, Mr. Lewis H. Morgan, and others—*were of the opinion that they were unquestionably of great antiquity, the absolute period of which could not of course be measured. The similarity in the weathering of the inscriptions to that of the rest of the tablets gave them this impression.* Most of them, however, preferred to defer any formal consideration of the subject until they could have good photographs or lithographs for suitable investigation at home, their examination in the excitement and pressure of the meeting being necessarily hurried.

Yours truly,

SPENCER F. BAIRD.

W. H. PRATT, ESQ., *Davenport, Iowa.*

SUPPLEMENTARY NOTE.

While the foregoing paper was in the hands of the printer, Volume III. of the "Transactions of the Anthropological Society of Washington" was received, and as its contents have an important bearing upon the questions under discussion, we will add a few notes by way of comment thereon. Thus, at the meeting held on December 4th, 1883, it appears that Major Powell, in the discussion which followed the presentation of a paper by Mr. William H. Holmes, on the "Textile Fabrics of the Mound-builders," made the following report concerning the paper of Mr. Henshaw under review:

"Mr. Henshaw, also of the Bureau of Ethnology, has made an interesting investigation of a subject which throws light upon this question. The early writers claimed that the stone carvings found in the mounds were often representations of birds, mammals, and other animals not now existing in the region where these mounds were found, and that the Mound-builders were thus shown to be familiar with the fauna of a tropical country, and they have even gone so far as to claim that they were familiar with the fauna of Asia, as it has been claimed that elephant pipes have been found. Now these carvings have all been carefully studied by Mr. Henshaw, and he discovers that it is only by the wildest imagination that they can be supposed to represent extralimital animals; that, in fact, they are all rude carvings of birds, such as eagles and hawks, or of mammals, such as beavers and otters, and he has made new drawings of these carvings, and will, in a publication which has gone to press, present them, together with the drawings originally published, and he makes a thorough discussion of the subject, being qualified thereto from the fact that he is himself a trained naturalist, familiar with these forms by many years of study. It will thus be seen that many lines of research are converging in the conclusion that the Mound-builders of this country were, at least to a large extent, the Indian tribes found inhabiting this country at the advent of the white man, and that in none of the mounds do we discover works of art in any way superior to those of the North American Indians."

We have quoted this paragraph in full, because it plainly indicates that the paper of Mr. Henshaw was not included by Major Powell in his official report through oversight, but that it had been by him carefully considered, and that its argument had his hearty approval and endorsement. The statement, however, that "these carvings have all been carefully studied by Mr. Henshaw," is scarcely borne out by the curious fact that he failed to discover the "tails" on our elephant pipes, but, on the contrary, based his principal argument against their authenticity upon the omission of these appendages.

In turning over the pages of these "Transactions," the careful reader will not fail to notice the frequency with which Major Powell presents his favorite theory that "the Mound-builders were the Indian tribes found inhabiting this country at the advent of the white man." It furnishes an important part of the entertainment at

nearly every meeting. If at any time omitted, it is a noticeable exception. It seems to have become almost a "craze," and to dominate all his thoughts. As constant droppings of water are said to wear even stones, so, it would seem, Major Powell considers that incessant iterations will finally establish his theory. Not only are the proceedings of the Anthropological Society thus taken up, but the limited scientific press of the country is largely occupied for the same purpose. At one time Major Powell appears in *Science* with a statement of his Indian theory, at another Professor Thomas occupies the pages of *The Antiquarian* with a restatement of the same theory. Wherever in the country there is published even a semi-scientific journal, large or small, there will be found a ready writer from the Bureau of Ethnology prepared to fill its columns with statements that the Indians were the true Mound-builders.

So, too, Mr. Henshaw prepares for a Government publication an elaborate paper to establish this theory, and Major Powell introduces it to the scientific public as a masterpiece of "thorough study" and exact research. Then Major Powell quotes from Professor Thomas, and Professor Thomas quotes from Major Powell, and both quote from Mr. Henshaw, for the purpose of establishing this theory. Thus reasoning in a circle, the Indian theory started out by Major Powell is returned to him, thoroughly embellished, by his obedient assistants. Thereupon Major Powell gravely announces to the scientific world that "many lines of research are converging" to the establishment of his new theory concerning the Mound-builders. If any reader should consider this a fanciful account of some "mutual admiration society," let him turn to the "Transactions" at the meeting of December 19th, 1883, and he will find that our statements have a substantial basis of fact:

"At our last meeting we had an interesting paper from Mr. Holmes, who, from his studies, concluded that the Mound-builders were no other than the Indians inhabiting the country. Last year we had a paper from Mr. Henshaw arriving at the same conclusion, from the facts discovered in another field of research. And now Professor Thomas finds that some of the earth-works of this country are domiciliary mounds, as suggested long ago by Lewis H. Morgan, who was the great pioneer of anthropologic research in America, and, further, that the houses found in ruins on the mounds are such as were built by the Indians, as recorded in the early history of the settlement of this country. Thus it is that from every hand we reach the conclusion that the Indians of North America, discovered at the advent of the white man to this continent, were mound-builders, and gradually the exaggerated accounts of the state of arts represented by the relics discovered in these mounds are being dissipated, and the ancient civilization, which has hitherto been supposed to be represented by the mounds, is disappearing in the light of modern investigation."

It will be perceived that no outside investigators are referred to by Major Powell, and hence that the sweeping phrase employed by him, "thus it is from every hand," must have reference solely to the work of his own assistants, and of these one was an entomologist and the other an ornithologist, and both without any extended or thorough experience in archæological research.

In this connection we must not omit to call attention to an injustice done Mr. Holmes by Major Powell in the above quotation. The former, in his paper upon "Prehistoric Textile Fabrics," thus stated his conclusions:

"The work described, though varied and ingenious, exhibits no characters in execution or design not wholly consonant with the art of a stone-age people. There is nothing superior to, or specifically different from, the work of our modern Indians."

In its passage through the alembic of Major Powell's intelligence, this conclusion of Mr. Holmes is thus curiously transformed:

"At our last meeting we had an interesting paper from Mr. Holmes, who, from his studies, concluded that the Mound-builders were no other than the Indians inhabiting this country."

Now, all that Mr. Holmes said was that the textile fabrics he was describing were not superior to, or specifically different from, the work of modern Indians; but, through the dominant thought ever uppermost in Major Powell's mind, it underwent the above remarkable transformation.

At this same meeting, also, Major Powell made the following interesting statement as to the antiquity of man on this continent:

"There is abundant evidence of antiquity—good, geologic evidence. Stone implements are found in geologic formation to such an extent as to leave no doubt that this continent was inhabited by man in early Quaternary time."

This fully agrees with the following recent statement made by Dr. D. G. Brinton in the third supplement to Johnson's Cyclopaedia:

"This presumed antiquity of the race is fully borne out by the discoveries of stone implements, chipped bones, and human remains in deposits dating back to the close of the glacial period in both North and South America. Such are the 'Trenton gravels,' near Trenton, New Jersey; the 'modified glacial drift' of the upper Mississippi; the 'lake beds' of Nebraska; the 'auriferous gravels' of California; the glacial 'mud-beds' of the pampas of Buenos Ayres, all of which have furnished undoubted specimens of human workmanship dating back to the close of the Tertiary and beginning of the Quaternary epochs, and thus proving that America was peopled throughout its whole extent at that remote date."

As it is now well established that the elephant also existed here in the Quaternary period, therefore, in making the above statement, Major Powell joins with Dr. Brinton in establishing the fact that man and mastodon coëxisted on this continent, and by this concession Major Powell removes the principal objection to the authenticity of the elephant pipes and inscribed tablets.

In looking over the discussions in this volume of "Transactions," the reader will discover indications of some confusion of thought in the expressions of Major Powell's views concerning the Mound-builders. Thus, he repeatedly urges, with great gravity, that some of the early tribes discovered on this continent were themselves mound-builders, and that many of these mounds were constructed within the historic period. No one will dispute this undoubted fact, but in no sense can it be said to support his theory. The statement that some tribes of modern Indians have built mounds is a poor argument by which to show the non-existence of a prior race of mound-builders of a higher grade of civilization. Certainly it cannot be claimed that any of the great earth-works and effigy mounds have been built by modern Indians within the historic period. There are occasions, too, when Major Powell seems to be on the point of abandoning his own theory. Thus, in the meeting of February 5th, 1884, in the discussion which followed the presentation of a paper by Prof. Cyrus Thomas, entitled "Cherokees Probably Mound-builders," Major Powell uses this language:

"We have not yet discovered what particular tribes built many of the mounds, nor is it possible to discover when they were built—that is, to fix with accuracy the date of their erection. Some of them have been built within the historic period,

doubtless, but very few compared with the whole number, and some of them are doubtless of great antiquity. And during all the centuries of history when these mounds were erected some tribes may have been destroyed, and there may be mounds built by tribes whose history is lost. Some of the Indian tribes occupying the continent at the advent of the white man were mound-builders, and a few mounds have been built since that time. The great number were erected prior to that time by these tribes, and perhaps by others still existing, but of whose mound-building we have yet no knowledge, and still others may have been built by tribes that are lost."

In his reference to mound-building by "tribes whose history is lost," Major Powell seems to almost abandon his own, and to accept the theory of Squier and Davis, that the Mound-builders were a distinct, and are now an extinct, race.

C. E. P.

February 19th, 1886.

ERRATA.

- Page 269, Note §, for "Britanica" read "Britannica."
" 289, line 13 of note, erase the name of "Peet."
" 298, " 13, for "Madeleine" read "Madelaine."
" 309, " 32, for "Primigenus" read "Primigenius."
" 317, " 24, for "Willis" read "Wills."
" 320, " 18, for "irrefragible" read "irrefragable."





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